



ZMM - SLIVEN
SLIVEN BULGARIA

UNIVERSAL LATHE MACHINES

C8C CU 325

MANUAL

KEEP THIS MANUAL AVAILABLE FOR FUTURE REFERENCE

MODEL	
D.B.C.	
SERIES No.	

Dear customer,

Thank you that you chose this lathe machine.

In this manual you will find required information for correct installation, operation and maintenance of the machine.

Before installation or maintenance of this machine it is compulsory for the operator and maintenance staff to read this manual first and followed all instructions contained herein.

All safety instructions to be strictly observe .

For a trouble free and safety operation with this lathe machine it must be only used in compliance with its application and technical specifications.

ZMM-Sliven keeps the right to make amendments and additions to this manual without written consent.

For more information please contact nearest ZMM-Sliven representative or your direct supplier.

Keep this manual in safety and easy for an immediate reference place.

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BULGARIA

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1 MACHINE DOCUMENTS

1.1 VERSION OF THIS LATHE

Note: Marking "4" on utmost right column indicates this machine configuration.

1.1.1	Model:	
1.1.2	Distance between centres	mm
1.1.3	Series No.:	
1.1.4	Year of manufacture:	
1.1.5	Version:	
	• Metric	<input type="checkbox"/>
	• Inch	<input type="checkbox"/>
	• Inch-Metric	<input type="checkbox"/>

1.1.6	Spindle nose:	
	• ISO702-III-1975(F) DIN 55027	No.5 <input type="checkbox"/>
	• USAS B5.9D1 (Camlock) ISO702-II-1975 (E)	D1- 5 <input type="checkbox"/>

1.1.7	Electric power supply	3 x V $\pm 5\%$, Hz $\pm 5\%$
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1.1.8	Installed power kVA
-------	-----------------	-----------

1.1.9	Main motor kW Vrpm
-------	------------	------------------------------

1.2 SHIPPING SHEET

Model:	D.B.C.:	mm
---------------	----------------	-----------

Series No.:	Year :
--------------------	---------------

Note:

Marking “4” on utmost left column indicates the configuration of the machine ordered with standard and optional accessories.

Remark “in the box” on the utmost right column describes that the respective item is packed in a packing box.

Item	Description	Qty	Remark
MACHINE STANDARD ACCESSORIES			
<input type="checkbox"/>	1.2.1 Main drive motor V.....kW Hz, rpm	1	
<input type="checkbox"/>	1.2.2 Electric installation completed by electric cabinet and control panel	1	
<input type="checkbox"/>	1.2.3 Main drive motor V-belts: 13x8x1500 L _p (A58)	3	In the box
<input type="checkbox"/>	1.2.4 Tool older guard	1	
<input type="checkbox"/>	1.2.5 Safety guard for the universal chuck	1	
<input type="checkbox"/>	1.2.6 Rear safety guard, movable	1	
<input type="checkbox"/>	1.2.7 Rear safety guard, fixed	1	
<input type="checkbox"/>	1.2.8 Coolant installation completed by motor-pump	1	
<input type="checkbox"/>	1.2.9 Work light	1	
<input type="checkbox"/>	1.2.10 Four-position tool holder	1	
<input type="checkbox"/>	1.2.11 Insert for the bed gap	1	
<input type="checkbox"/>	1.2.12 Changeover gears		
<input type="checkbox"/>	1.2.12.1 Metric version: 25,45,50,52,57,58,60,70,75,80,90,96,100,120,127	1	In the box
<input type="checkbox"/>	1.2.12.2 Inch version: 25,40,42,45,58,60,63,70,75,80, 90,94,95,96,100,117,120,127	1	In the box
<input type="checkbox"/>	1.2.13 Set of bolts and shims for machine foundation	1	In the box
<input type="checkbox"/>	1.2.14 Dead centre Morse 3	1	In the box
<input type="checkbox"/>	1.2.15 Reducing sleeve: Morse 4.5/3	1	In the box
<input type="checkbox"/>	1.2.16 Tool holder key	1	In the box
<input type="checkbox"/>	1.2.17 Camlock key	1	In the box
<input type="checkbox"/>	1.2.18 Key for the tailstock quill	1	In the box
<input type="checkbox"/>	1.2.19 Machine manual (this manual)	1	
<input type="checkbox"/>	1.2.20 Machine electric documentation	1	
<input type="checkbox"/>	1.2.21 Flange for 3-jaw self centring universal chuck Ø 160 with studs and nuts	1	
<input type="checkbox"/>	1.2.22 Packing wooden pallet and plastic cover	1	
<input type="checkbox"/>	1.2.23 Packing box	1	

Item	Description	Qty	Remark
OPTIONAL ACCESSORIES			
<input type="checkbox"/>	1.2.24 4-jaw independent chuck Ø250, assembly	1	
<input type="checkbox"/>	1.2.25 Faceplate, Ø300	1	
<input type="checkbox"/>	1.2.26 Set of optional changeover gears for threading Metric pipe threads : 40,44,60,95,115	1	
<input type="checkbox"/>	1.2.27 Set of optional changeover gears for threading Inch pipe threads : 44, 52,115	1	
<input type="checkbox"/>	1.2.28 Safety drive plates for lathe dogs: Size 5 (in accordance with DIN, ISO, USAS)	1	
<input type="checkbox"/>	1.2.29 Set of studs and nuts (when any of items 1.2.21,1.2.24, 1.2.25, 1.2.28 is ordered)	1	In the box
<input type="checkbox"/>	1.2.30 Lathe dogs: Ø20; Ø50	4	In the box
<input type="checkbox"/>	1.2.31 3-jaw drill chuck with key, Ø 20 mm	1	In the box
<input type="checkbox"/>	1.2.32 Arbor, Morse 3 for drill chuck Ø 20 mm	1	In the box
<input type="checkbox"/>	1.2.33 Live centre, Morse 3 for tailstock	1	In the box
<input type="checkbox"/>	1.2.34 Follower rest: Ø10÷Ø70	1	
<input type="checkbox"/>	1.2.35 Steady rest: Ø10÷Ø70	1	
<input type="checkbox"/>	1.2.36 Taper turning attachment ±10° x 250	1	
<input type="checkbox"/>	1.2.37 Thread cutting dial	1	
<input type="checkbox"/>	1.2.38 3-jaw universal self centering chuck, :Ø160	1	
<input type="checkbox"/>	1.2.39 Packing wooden case	1	
1.2.40 REQUIRED SPARE PARTS			
<input type="checkbox"/>	1.2.40.1 Cam C8M.01.08.06-C8C	1	In the box
<input type="checkbox"/>	1.2.40.2 Shoe, assembly /κ/ CY310.01.08.00-CY325	1	In the box
<input type="checkbox"/>	1.2.40.3 Sleeve C8M.00.04	1	In the box
<input type="checkbox"/>	1.2.40.4 Round pin 6x8	2	In the box

1.3 TECHNICAL SPECIFICATIONS

Parameter	Unit	Value
C8C, CY325		
Capacity		
Height of centres:		
Over slide ways	mm	165
	inch	
Distance between centres	mm	750
		1000
	inch	
Bed width	mm	200
	inch	
Noise level DIN 45635 Teil 1	dB(A)	83
Workpiece dimensions		
Maximum workpiece machining diameter: Over slide ways	mm	325
	inch	
Maximum workpiece machining diameter: Over carriage	mm	185
	inch	
Bar material	mm	30
	inch	
Over gap (DBC:1000)	mm	440
	inch	
In rest:		
Follower rest	mm	10÷70
	inch	
Steady rest, basic	mm	10÷70
	inch	
Machining length in gap from face plate	mm	192
	inch	
Spindle		
Spindle nose ISO702-II/USAS B5.9D1 ISO702-III/DIN 55027		Size 5
Spindle bore for bar material	mm	32
	inch	
Spindle taper hole		Morse 4.5
Diameter under front bearing	mm	55
	inch	
3-jaw self centring chuck		160
Gearbox		
Number of speeds and ratio		12/24 $\varphi = 1.32$
Speed range:		
Single-speed motor 1420 rpm; 2.2kW		85-2000
Double-speed motor 710/1420 rpm; 1.4/2.2kW		42.5-2000
Drive		
maximum installed power		kW 2.3
Main motor power		
Single-speed power		rpm; kW 1420 rpm; 2.2kW
Double-speed motor		rpm; kW 710/1420 rpm; 1.4/2.2kW
Coolant pump motor power		kW 0.09
Coolant pump motor speed		rpm 2780
Power specifications		
Spindle max. speed whereat transmission of the full power is admissible		rpm 200
Spindle max. torque		daN.m 140
Feed drive admissible maximum tow strength		daN.m 100
Feeds:		
Number of feeds		48
Range of longitudinal feeds:		
Metric version		mm/rev 0.006-1.77
Inch version		mm/rev 0.008-2.23
Longitudinal to cross feeds ratio		2/1
Lead screw		
Diameter x pitch	mm x mm	28x8
	mm x tpi	

Parameter	Unit	Value
C8C, CY325		
Threads		
Range of threads:		
Metric	mm	0.1-28
Inch	TPI	75-2.5
Module	mm	0.1-1.75
Diameter-pitch	tp/π"	70-4
Carriage		
Cross slide maximum travel	mm	165
	inch	
Upper slide maximum travel	mm	95
	inch	
maximum angle of indexing		±90°
Toolholder		
Four position:		
Height of the tool trust surface to centre line	mm	20
	inch	
Tool maximum dimensions (height x width):	mm	20x20
	inch	
Angle of indexing		360° (8x45°)
Tailstock		
Quill diameter	mm	40
	inch	
Quill taper hole		Morse 3
Quill maximum travel	mm	100
	inch	
Tailstock side displacement	mm	±10
	inch	±25/64
Four-jaw independent chuck (option)		
Diameter	mm	250
	inch	
Width	mm	70
	inch	
Face plate (option)		
Diameter	mm	300
	inch	
Width	mm	40
	inch	
Taper turning attachment (option)		
Maximum turning length	mm	250
	inch	
Maximum turning taper		±10°
Overall dimensions		
Length at following D.B.C.:		
750mm / in	mm	1884
	inch	
1000mm / 39 3/8in	mm	2195
	inch	
Width	mm	750
	inch	
Height	mm	1270
	inch	
Weight		
750 mm	kg	630
1000 mm	kg	700

2 SAFETY OPERATION WITH THE MACHINE

Warning: This lathe machine contains dangerous moving parts and high voltage electric components that may cause accidents if respective safety precautions are not observed.

2.1 SAFETY WARNINGS IN THIS MANUAL AND SIGNS ON THE MACHINE

2.1.1 THE WORD “WARNING” IN THIS MANUAL

The word “**Warning**” precedes any instruction where any failure to observe it may be hazardous for the operator and machine functioning.

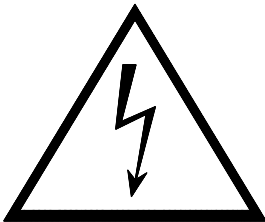
2.1.2 SIGN “ATTENTION” ON THE MACHINE



Meaning:

This sign warns about a dangerous spot on the machine.

2.1.3 SIGN “HIGH VOLTAGE” ON THE MACHINE

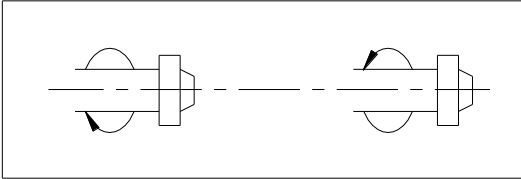


Meaning:

This sign warns about machine electric components that are mortally dangerous .

2.1.4 WARNING SIGNS ON THE MACHINE FOR THE SPINDLE DIRECTION OF ROTATION

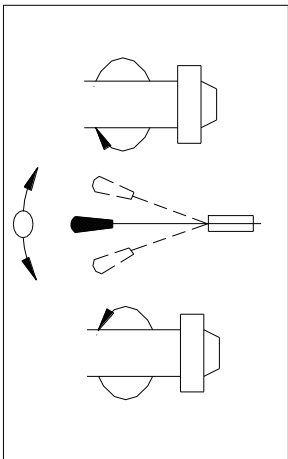
C8C



Meanings:

- When the lever is on **right** position spindle rotates **counterclockwise**
- When the lever is on **left** position spindle rotates **clockwise**

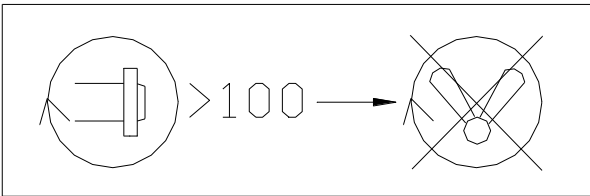
CU 325



Meanings:

- When the lever is on **up** position spindle rotates **clockwise**
- When the lever is on **lower** position spindle rotates **counterclockwise**

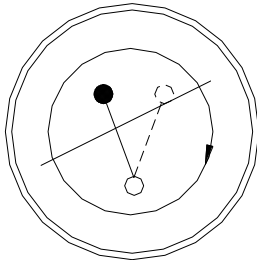
2.1.5 WARNING SIGN ON THE MACHINE FOR HAZARD WHEN SHIFTING FEED BOX HANDLES



Meaning:

Do not shift the feed box handles when the spindle speed is **over 100 rpm**

2.1.6 WARNING SIGN ON THE MACHINE FOR HAZARD WHEN SHIFTING GEARBOX HANDLES



Meaning :

Do not shift gearbox handles when spindle running.
Always **stop spindle** before speed change

2.2 SAFETY INSTRUCTIONS FOR THE END USER

2.2.1 MACHINE SAFETY DEVICES

This machine is factory provided with the following safety devices:

- **Share pin on the feed box output shaft**
For protection when dangerous overload occurs.
- **SAFETY GUARDS:**

Rear safety guard. Protects against unintentional access into machine working area and against chips and coolant splash.

Toolholder guard. Protects the operator against chips.

Lead screw and shaft guard. (Available for CE version, only). Protects against unintentional access to rotating lead screw and shaft.

Chuck guard (integrated with micro switch). Protects against dangerous access into dangerous area of rotation of the universal chuck, faceplate and drive plate. When opened the micro switch automatically stops the machine.

- **SAFETY MICRO SWITCHES:**

Micro switch on quadrant box door. Protects against rotating quadrant parts when the door is to be opened.

Micro switch on control lever for spindle forward and reverse rotation

When the main power supply failed this micro switch protects against dangerous machine restart when the supply is restored.

- **EMERGENCU STOP PUSHBUTTONS (red mushroom) :**

Emergency stop pushbutton on the machine control panel.

Emergency stop pushbutton on the machine fixed rear guard (CE version DBC 1000).

Must be used for emergency stop, ONLY.

- **EMERGENCY STOP PEDAL (option) CU325; C8C CE**

Located below along the machine length for an immediate actuating by foot to stop the machine in emergency.

Must be used for emergency stop, ONLY.

2.2.2 GENERAL SAFETY PRECAUTIONS FOR MACHINE OPERATION AND MAINTENANCE

- Excursive periodical verification for mounting and functional condition of machine safety devices.
- Operate the machine if the safety devices function is correct , only.

<p>Warning: Any remove, design alteration or isolated the function of whatever safety device is hazardous for the operator, maintenance personnel and environment.</p>

- Before operation or maintenance works with the machine it is essential for the operator and maintenance personnel to read and understand this manual.
- All precautions and instructions in this manual and signs and labels on the machine shall be strictly observed.
- Keep this manual in clean and safety place so the be available to operator and maintenance personnel any time.

2.2.3 INSTRUCTIONS FOR OPERATOR AND MAINTENANCE PERSONNEL

- The operator of this machine to be trained for operation with lathe machine, duly authorized and instructed for safety work in compliance with local safety norms. Before operation with this machine the operator must read and understand the present safety instructions.
- The mechanic and electrician for this machine maintenance to be trained for maintenance of machine tools duly authorized and instructed for safety maintenance of this machine in compliance with local safety norms. Before operation with this machine the operator must read this manual and understand the present safety instructions.
- The machine to be used in compliance with its application only and having all safety instructions and recommendation in this manual observed.
- Before machine start verify the correct condition of all safety devices and their trouble free function.
- Excursive periodical verification for the functional condition of machine safety devices.
- When the machine is shut down for a short or long time take all safety measures so that it should not be a source for hazardous circumstances as unintentional powered or start.
- Tools, accessories, workpieces etc., to be kept outside the machine on their defined locations. Do not place them on the machine, inside the bed or other machine locations so that be a reason for hazard.

- Keep the machine and service area around clean and tidy. Arrange materials, tooling, accessories etc., in the service area in a way that ensure easy and trouble free handling by the operator ant no accident occurs.
- Keep workpieces, tools and accessories clean without chips or oil deposits.

Warning: Thoroughly clean the workpiece to be machined from deposits and oil the workpiece before placing and chucking.

Warning: Keep clean and dry service area around the machine.

Warning: Never use pressurized air for machine or chips cleaning.

- The machine operator must wear safety work clothing, glasses, bonnet and shoes. Long hairs to be kept under the bonnet, clothing buttoned and shoes ties fastened.

Warning: When in operation do not wear hand rings, wrists, chains, rings and others that may be caught from the moving machine parts.

- When operate the machine with coolant follow the coolant manufacturer instructions for safety.
- When chucking a workpiece to be machined ensure the chucking so that no hazard occurs during rotation. When operate with various chucking accessories observe the chucking device manufacturer instructions for mounting and maximum speed of rotation allowed. Always select those cutting conditions that are safety for operator and machine.

Warning: It is not admissible to operate with dead centre on tailstock quill. Very Dangerous!

- In emergency the operator must immediately stop the machine and let his foreman or authorized service technician.

Warning: It is not admissible to eliminate mechanical or electrical trouble by persons that are not trained and duly authorised for the purpose.

Recommendation: Chip deposits on the chucking accessory and cutting tool to be eliminated by a suitable safety tool. Fig. 2-1 below shows a recommended for this purpose tool.

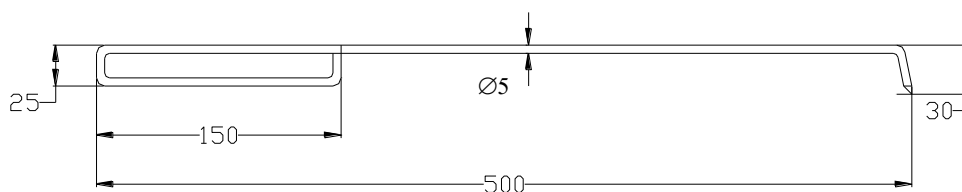


Fig. 2-1. Recommended tool for eliminating chips

To the end-user:

- Fail to observe the safety instructions in this manual and maintaining all machine devices and parts in normal working conditions may result to hazard for the operator and maintenance personnel, environment and machine itself and may voids machine warranty.
- Safety instructions in this manual do not substitute the local/national safety standards/norms.

3. MACHINE INSTALLATION AND START UP

3.1 MACHINE SHIPMENT PACKING

The machine is shipped from the factory to be transported to the end user packed on wooden pallet or into wooden case. (see Fig. 3-1 and Fig. 3-2).

3.1.1 LIFTING AND DISPLACEMENT MACHINE ON WOODEN PALLET

Warning: The equipment for lifting and displacement the machine must comply with the machine weight. Avoid jerks and impacts that may affect the machine accuracy.

Table 3-1. Approximate gross weight of machine on wooden pallet

Model ⇒	C8C	CU325
DBC ↓ (mm)	Weight (kg)	Weight (kg)
750	630	630
1000	700	700

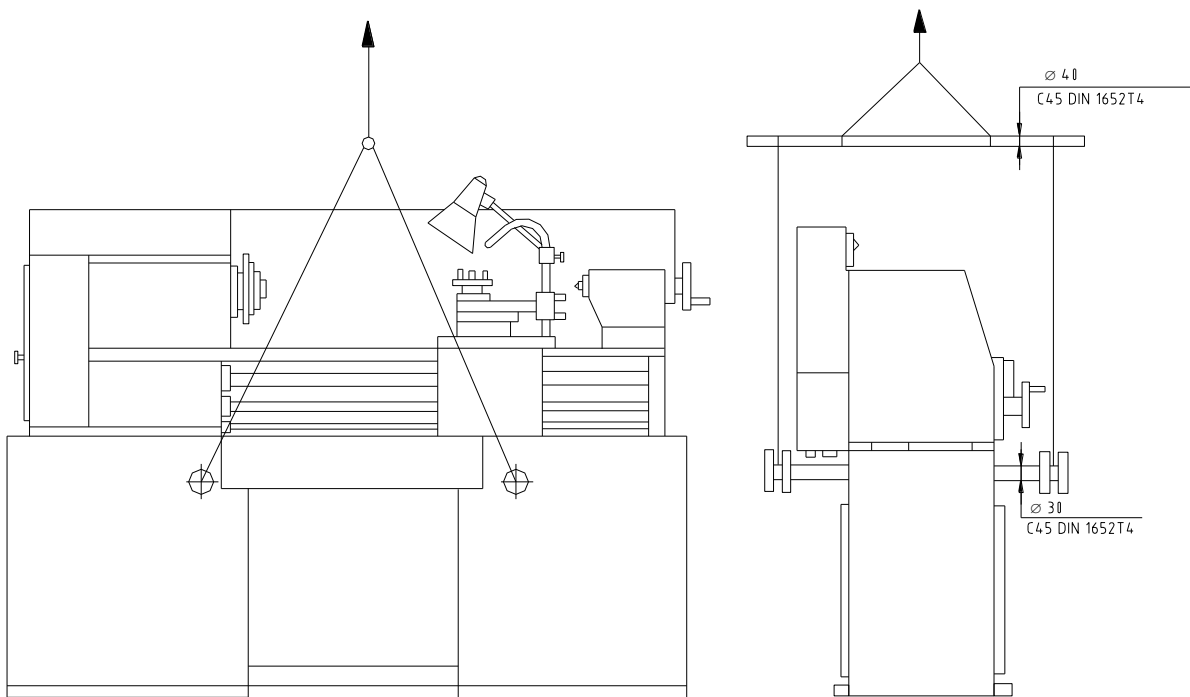


Fig. 3-1. Lifting and displacement machine on wooden pallet

3.1.2 INSTRUCTIONS FOR LIFTING AND DISPLACEMENT MACHINE ON WOODEN PALLET (See Fig.3-1)

- Crane, hoist or another lifting equipment using ropes or belts having capacity according machine gross weight can perform lifting and displacement of the machine.
- Rods of mild steel (Cт45, C45) and diameter of 50mm are protruded through machine feet holes. Rods length should be bigger then machine feet width.
- Before lifting ensure that all movable parts are fixed. The tailstock should be position end of bed and clamped; steady rest to be fixed close to tailstock and carriage to be position in the bed middle and clamped by lock plates; the half nut must be engaged.

3.2 LIFTING AND DISPLACEMENT MACHINE IN WOODEN CASE

Warning: The equipment for lifting and displacement must comply with machine weight. Table 3-2 below shows the approximate machine gross weight.

Table 3-2. Approximate gross weight of machine in wooden case

Model ⇒	C8C	CU325
DBC ↓ (mm)	Weight (kg)	Weight (kg)
750	900	900
1000	1000	1000

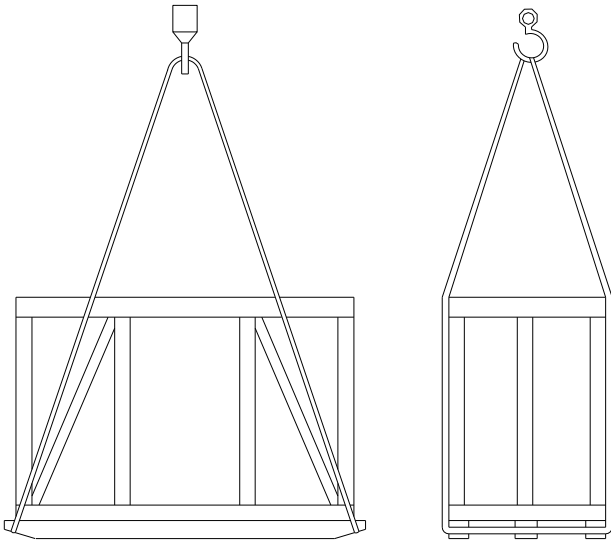


Fig. 3-2. Lifting and displacement machine in wooden case

Warning: Do not stay under lifted object. Grave danger.

3.3 MACHINE UNPACKING

3.3.1 PRELIMINARY CHECKS

Upon machine arrival check machine packing condition and the delivery items in accordance with the order and section 1.2. If damages or missing items during transportation found please immediately inform your supplier.

3.3.2 UNPACKING MACHINE PACKED ON WOODEN PALLET

The machine is fixed on the wooden pallet by bolts. Remove all fixing bolts and machine is ready to be lifted and displaced in compliance with the instructions under section 3.1.

3.3.3 UNPACKING MACHINE PACKED IN WOODEN CASE

Unpack the machine as following:

- First remove wooden case top
- Remove the wooden case wall from the carriage side
- Remove both wooden case walls (from headstock side and tailstock side)
- Remove the last wooden case wall (from the machine rear side)

Remove all bolts that fixed the machine to wooden case bottom and machine is ready to be lifted and displaced in compliance with the instructions under section 3.1.

3.4 CLEANING THE MACHINE

Before shipment from the factory all machine parts not painted are covered with a compound that protects them against corrosion during transportation and storage.

Clean the anti-corrosion compound by soft cloth damped with solvent like mineral alcohol or aliphatic petrol solvent commercially available.

Immediately dry the cleaned parts by soft cloth.

Do not use hard brush or another metal accessories that may damage the machine surfaces.

Avoid splashing solvent over painted machine surfaces for some solvents may damage the paint.

<p>Warning: Do not use high volatile and combustible solvents that are dangerous for the electric installation and firing. Do not smoke or use fire 10 metres around when cleaning the machine.</p>
--

3.5 MACHINE POSITIONING, FOUNDATION AND LEVELING

To maintain the guaranteed machine accuracy it is of great importance to install and accurately level the machine on its foundation place.

3.5.1 FOUNDATION

The foundation is to be made by concrete in compliance with machine foundation layout Fig. 3-3 or Fig. 3-4. Outside dotted line denotes machine-working area necessary for operation and service.

The foundation concrete thickness is recommended not less than 350 mm. The anchoring/foundation bolts holes in the foundation shall be 80x80x350 mm.

When the machine is to be installed on area where shock and vibrations sources exist it should be necessary to insulate the foundation by an anti vibration material.

3.5.2 INSTALLATION AND LEVELING

When the concrete is compactly hardened install and level the machine as following:

- Place the levelling plates close to foundation holes so that when positioning the machine on place its levelling bolts step on the plates, and the foundation bolts go into the foundation holes.
- At this position place a level gauge of an accuracy 0,02/1000mm. By the levelling bolts make an initial machine levelling in compliance with Check No.1, DIN 8606 (Refer to section 8 "Protocol for geometric accuracy").
- Then prepare a concrete mixture 1:3 (cement: sand) and fill the foundation holes up and also fill up entire gap between foundation surface and machine feet so that the machine step firmly on the foundation.
- When the concrete is compactly hardened uniformly tighten foundation bolt nuts.
- Check the machine levelling again and adjust if necessary.

The machine may be alternatively installed directly on an enough rigid concrete floor. Levelling plates are placed directly on the floor and the machine levelling bolts step on them. Then the levelling procedure is made as describe above.

This method shows satisfactory machining accuracy and it is preferable when the machine is to be often displaced from one place to another.

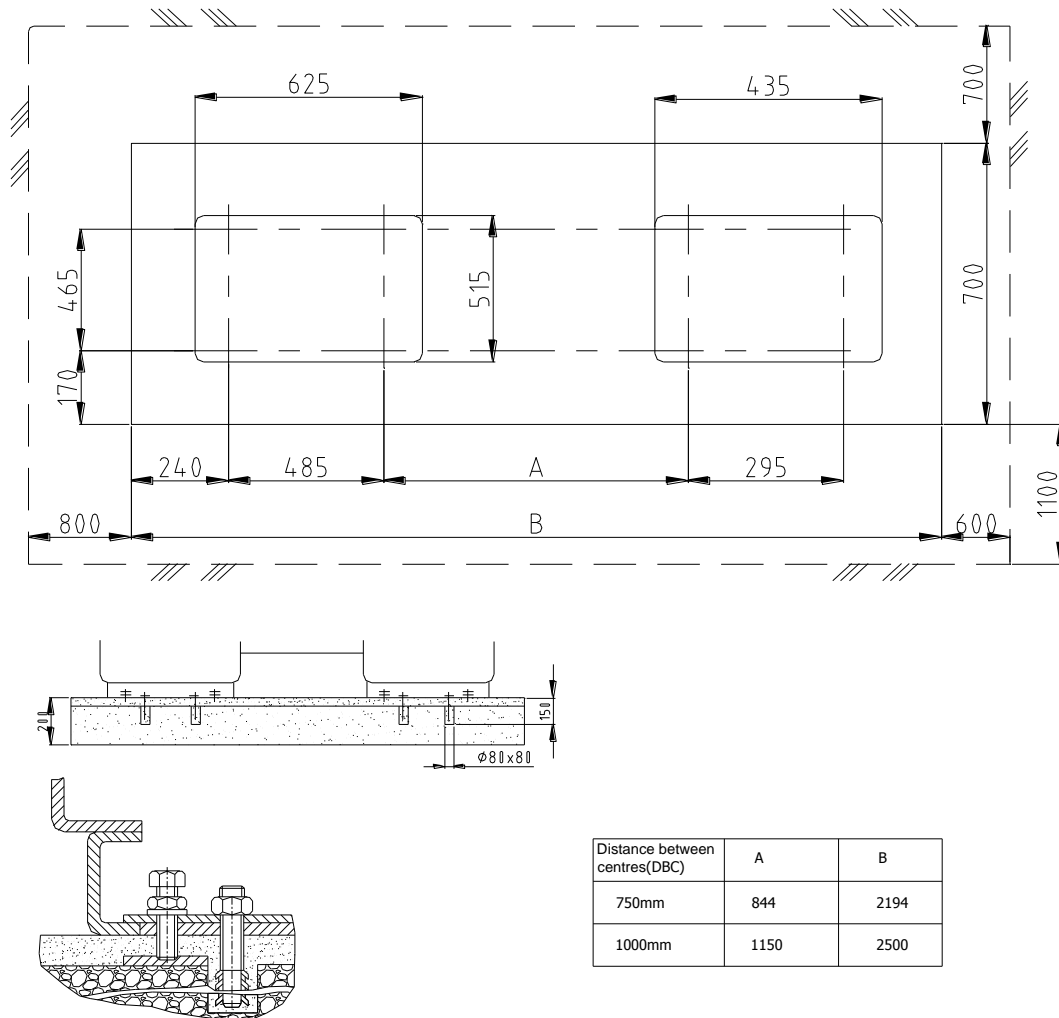


Fig. 3-3. Machine foundation layout

3.5.3 PERIODICAL CHECKS OF MACHINE LEVELING

Exercise periodical checks on machine longitudinal and cross levelling and adjust if necessary, as following:

- In a 3 months periods for machine installed by foundation bolts
- Every months for machine installed directly on the floor.

Note: Please have in mind that correct machine installation and levelling is very important condition for machine operation and accuracy of machining.

3.6 CONNECTION TO MAINS

Warning: Only qualified electro technician may perform connection works after reading and understanding this manual.

When connection the machine to mains following measures should be observed:

- Verify if the machine electrical specification comply to the mains;
- Connect the machine via fast acting disconnecter following the specifications in the “Shipping documents E100” attached to this manual.
- The power supply cable section must comply with machine power and distance to local electric cabinet following the specifications in the “Shipping documents E100” attached to this manual.
- Protect the power supply cable at machine entrance by hard cable duct (pipe).
- Ensure correct machine ground. This is valid for mains of direct grounded star-center. For countries where the electric supply nets are low voltage net and isolated-star center the machine must be ground in compliance with the national standards. Connection to ground or neutral for nets of having isolated star-center is made using the input ground/neutral bar where the input ground/neutral wire is to be connected.
- Before switching the supply on provide check of all electric components condition as electric cabinet, controls, terminal connections etc. and tighten if necessary.
- After switching the power on check to verify the lack of dangerous electric potentials of the machine to ground.
- Execute several tests with machine electrical controls to verify the correct function in compliance with section 3.7.

3.7 VERIFICATION THE FUNCTION OF MACHINE ELECTRIC CONTROLS AFTER CONNECTION

Very important: This machine is delivered to you without oil in gearbox, feed box and apron. Before electric components verification it is necessary these boxes to be fill up by oil and also lubricate respective machine parts in compliance with the instructions under section 5 of this manual.

Execute verification of the electric controls function (refer to machine electric diagram) as following:

- Turn the main power switch QSO on position “I”. Indicator HL on the control panel goes on indicating electric cabinet live.
- Start the main drive motor by pushbutton SB1 and stop it by pushbutton SB0.1
- Verify the function of the coolant pump motor by ON/OFF SB2.
- Verify work light by switch SB4.

3.8 MACHINE START UP

When start up the machine after installation or after long time being shut down it is necessary to verify machine lubrication condition. Also the machine must be cleaned after long time being shut down. Check the oil level in gearbox, feed box and apron as well as piston oil pump oil box. Lubricate bed slide ways, carriage slides, lead screw and tailstock.

Machine start up procedure:

- Manually move the machine movable parts. The parts should move smooth without any resistance;

- Check all machine control levers and handles ;
- If the machine will operate with coolant fill the coolant tank with coolant liquid as per section. 4.9.
- Turn the main switch on electric cabinet on position “I”. The indicator on control panel should goes on indicating electric cabinet live;
- Run the drive motor by pressing motor Start pushbutton;
- At this moment verify if the drive motor direction of rotation. The correct direction of rotation must comply with the arrow marked on gearbox drive pulley (**Counter clockwise**). If direction of rotation found incorrect it **must** be immediately adjusted immediately by change the connection of two input phases in the electric cabinet.
- Verify the gearbox function testing all speed ranges;
- Verify coolant system function;
- Run the machine for 2-hours of idle operation. Then check the oil level in the respective boxes. Add oil if necessary. Refer to section 5 “Lubrication”;
- After two-shift machine operation check the main drive V-belts tensioning and adjust if necessary. Refer to section 6 “Machine maintenance”.

4 OPERATION WITH THE MACHINE

4.1 GENERAL

The following information is designated to an operator that is trained and authorized to operate with universal lathe machines.

4.2 APPLICATION OF THE MACHINE

This lathe machine may be applied for machining of internal and external surfaces, threading of metric, inch, module, diameter-pitch threads on workpieces of steel, cast iron, non-ferrous metals and plastics.

Workpiece taper surfaces may be machined using the taper turning attachment (option).

The maximum workpiece dimensions that may be machined on this machine can be found under section 1.3.

Warning: This machine may be only used in compliance with its application and technical specifications under section 1.3. Any application of this machine outside its specifications or any modification or usage of non-original parts may lead to hazards and may void the machine guarantee.

Emergency stop: There is an emergency stop pushbutton (red mushroom) on these machines. An emergency stop pedal also is available as an option. (C8C CE; CU325; CU325 CE).

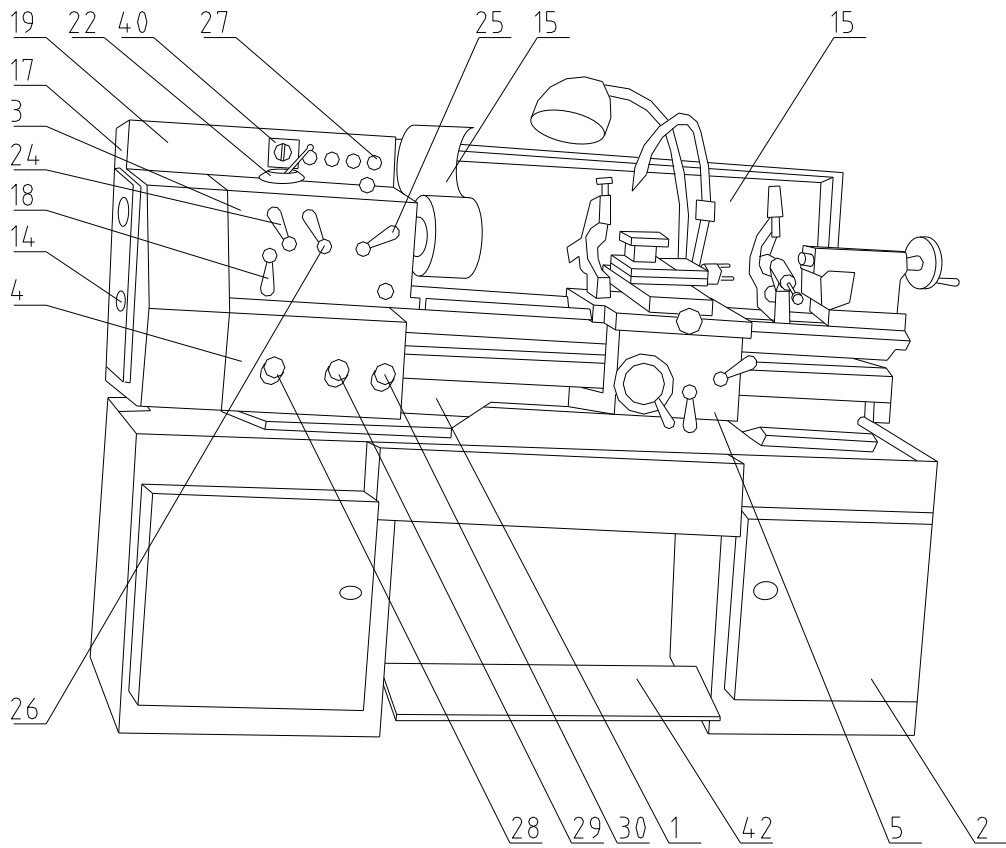
These emergency stop devices must be used in emergency circumstances only.

Do not use these devices as a normal operation stop of the machine.

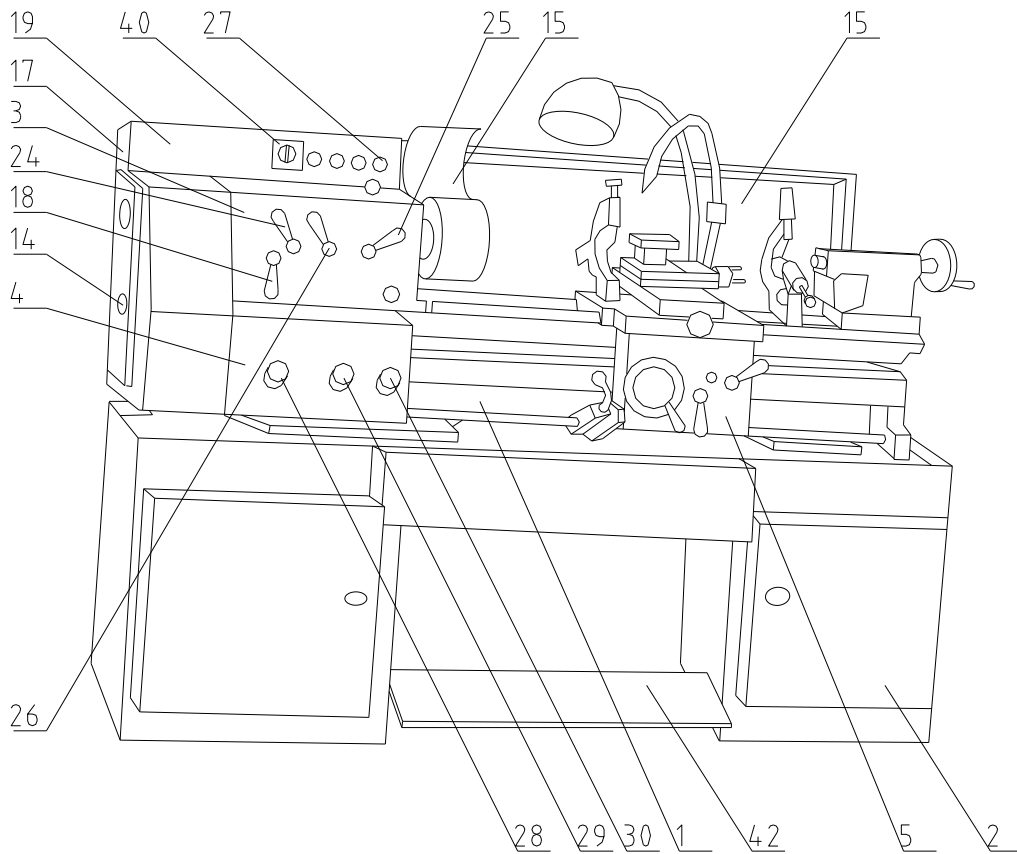
4.3 MACHINE MAIN PARTS AND CONTROLS

Fig.4-1, Fig.4-2, Fig.4-3 show the machine main parts and controls.

- 1 Bed
- 2 Feet
- 3 Gearbox
- 4 Feed box
- 5 Apron
- 6 Lower carriage
- 7 Upper carriage
- 8 Tailstock
- 9 Drive
- 10 Control shaft
- 11 Quadrant
- 12 Toolholder
- 13 Protection stop
- 14 Quadrant door
- 15 Guards
- 16 Rests, complete
- 17 Electric cabinet
- 18 Handle for setting left hand and right hand thread
- 19 Control panel
- 20 Coolant system
- 21 Work light
- 22 Control lever for spindle forward or reverse direction of rotation or stop.
- 24 Handle for speed step select.
- 25 Handle for speed range select.
- 26 Handle for speed step.
- 27 Emergency stop push button
- 28 Handle for feed pitch or thread select.
- 29 Handle for feed pitch or thread select.
- 30 Handle for shifting the motion to the lead shaft or lead screw.
- 31 Handle for nut engagement or disengagement.
- 32 Control lever for the longitudinal and cross travels.
- 33 Handwheel for manual longitudinal travel.
- 34 Handwheel for manual cross travel.
- 35 Handwheel for manual upper carriage manual travel.
- 36 Vernier for longitudinal travel read out.
- 37 Handwheel for manual travel of the tailstock quill.
- 38 Handwheel for clamping the quill .
- 39 Handwheel for clamping the tailstock .
- 40 Main power disconnecter
- 42 Emergency stop pedal
- 43 Handwheel for cross and longitudinal automatic feed.

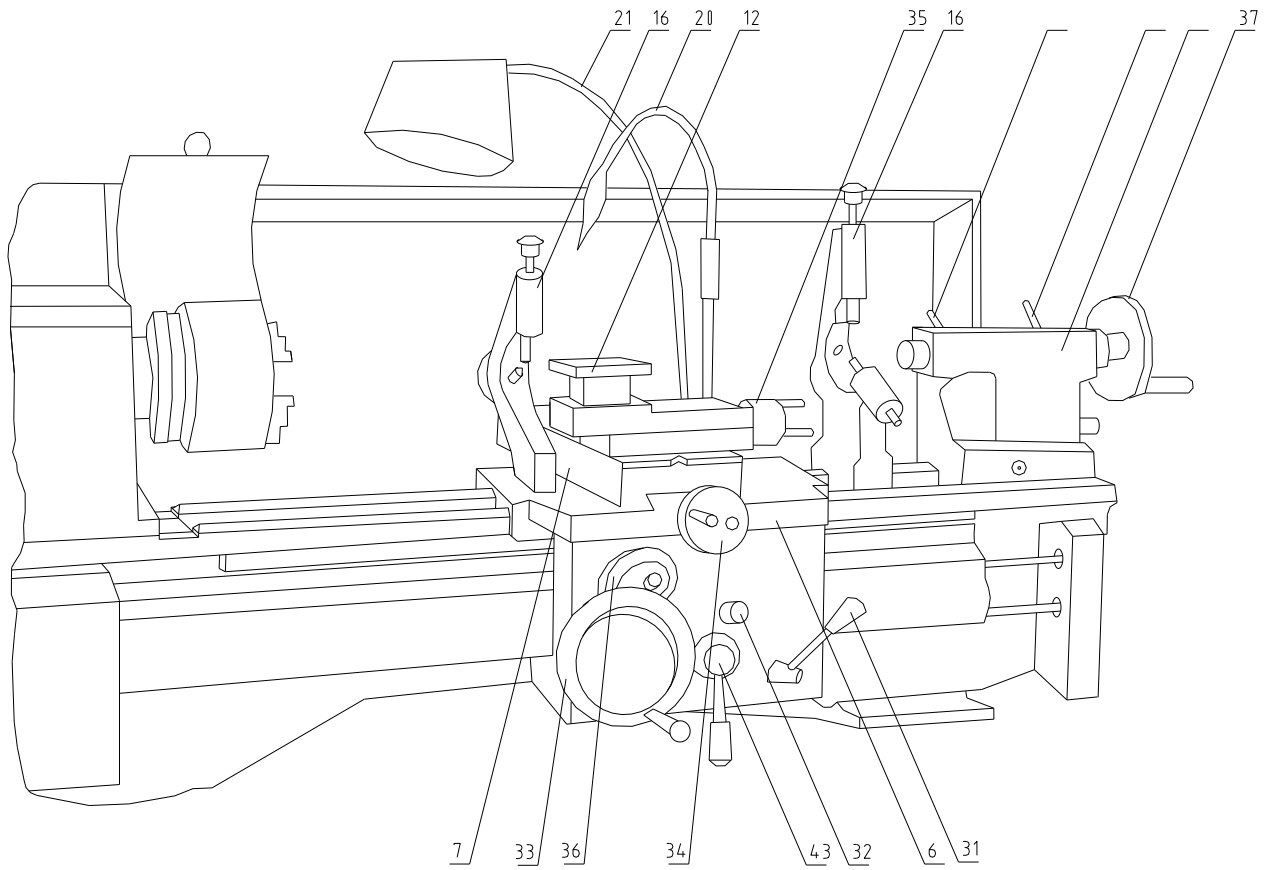


C8C

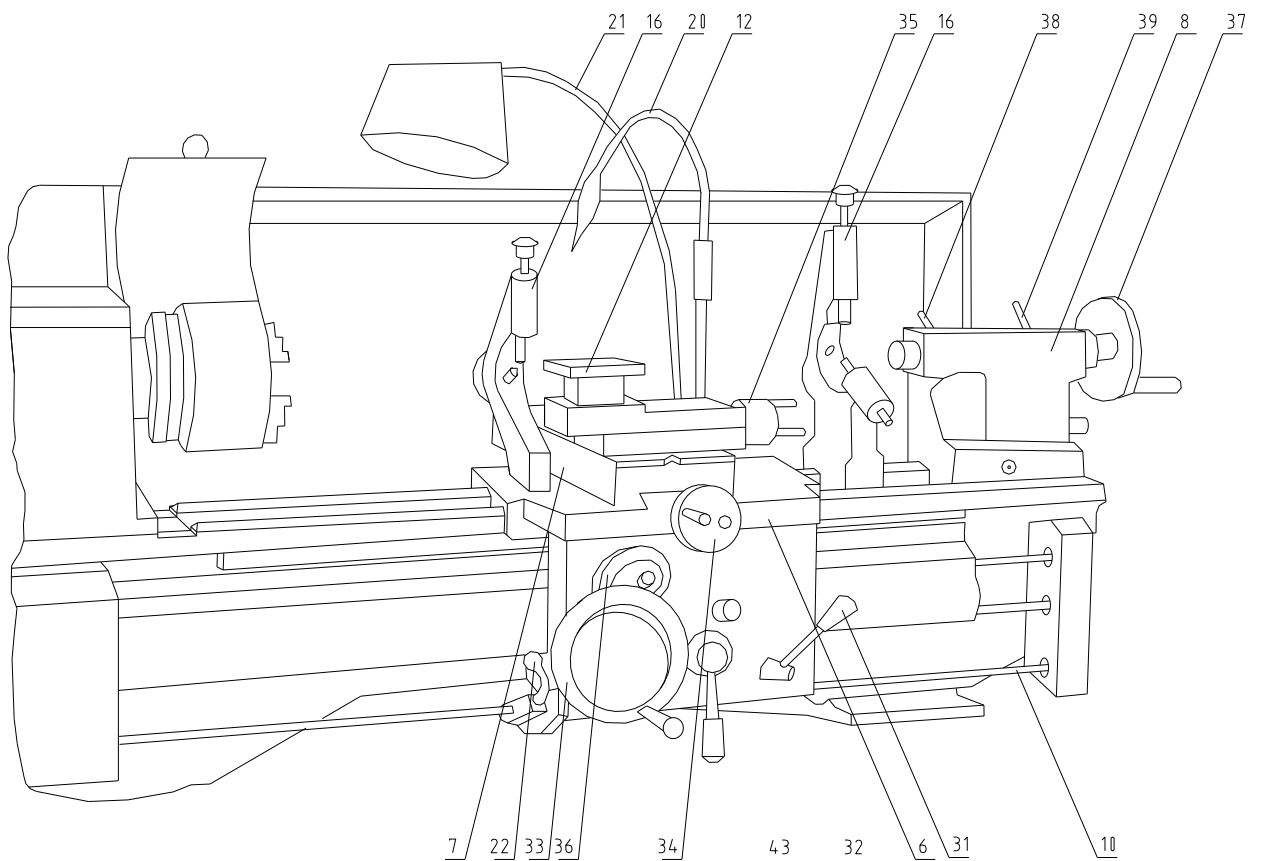


CU325

Fig.4-1. Machine main parts and controls



C8C



CU325

Fig.4-2. Machine main parts and controls

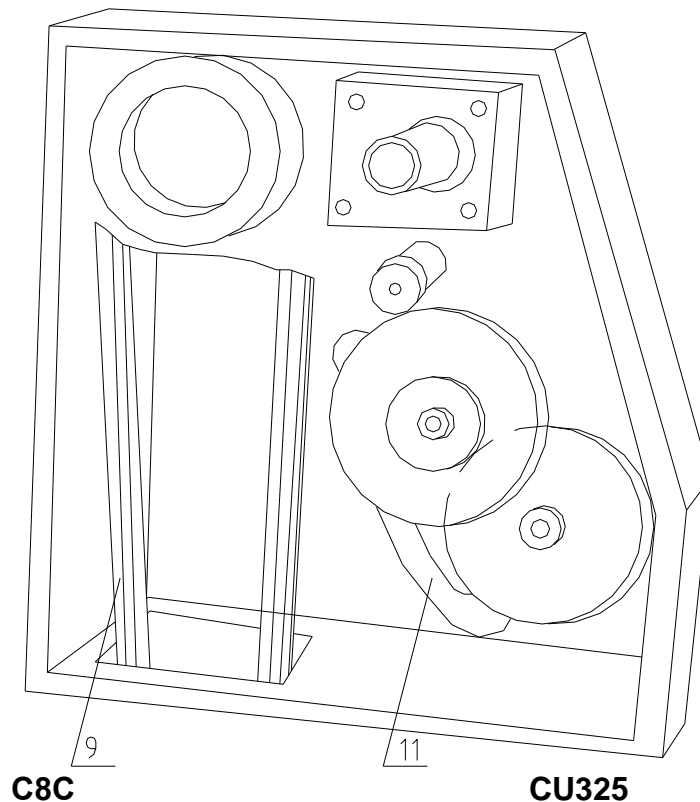


Fig.4-3. Machine main parts and controls

4.4 SPINDLE SPEED SELECT

Universal lathes C8C and CU325 are available as either 12- speeds when single-speed drive motor is installed or 24-speeds when double-speed drive motor is installed.

Fig. 4-6 and Fig. 4-7 show the spindle speeds of rotation.

Handles 15, 24 and 26 serve to select spindle speed following the instructions on plates Fig.4-6 and Fig. 4-7. For machine provided by double-speed drive motor it is also necessary to observe the position of drive motor speed select switch.

Warning: Spindle speed change must **ONLY** be performed after spindle stop. Any attempt to change the spindle speed when it is running leads to a serious damage of the gearbox and voids the guarantee.

4.5 FEED DRIVE

The machine feed drive and threading mechanism is consists of:

- **Left hand and right hand thread mechanism:** it is located in the gearbox and is controlled by handle 18, Fig.4-1;

- **Quadrant 11, Fig.4-3:** it is set for operation by arranging a set changeover gears and in compliance with the plate for threads and feeds Fig.4-9, Fig.4-10, Fig.4-11, Fig.4-12;

- **Feed box 4, Fig.4-1:** by handles 28 and 29 it is set for respective thread pitch or feed rate and by handle 30 for the thread type and feed rate.

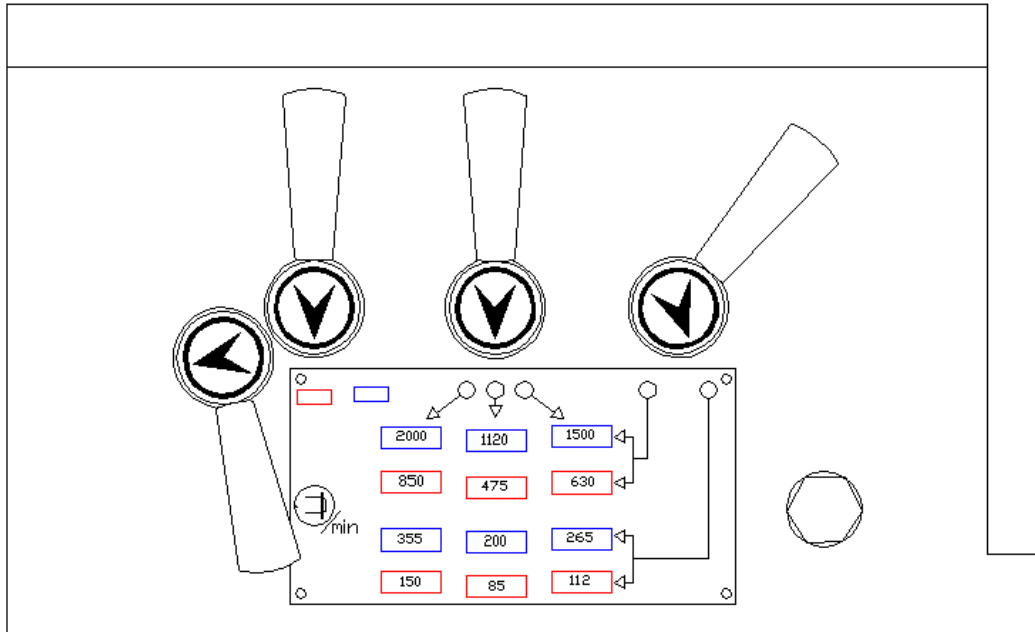


Fig.4-6 Single-speed drive motor

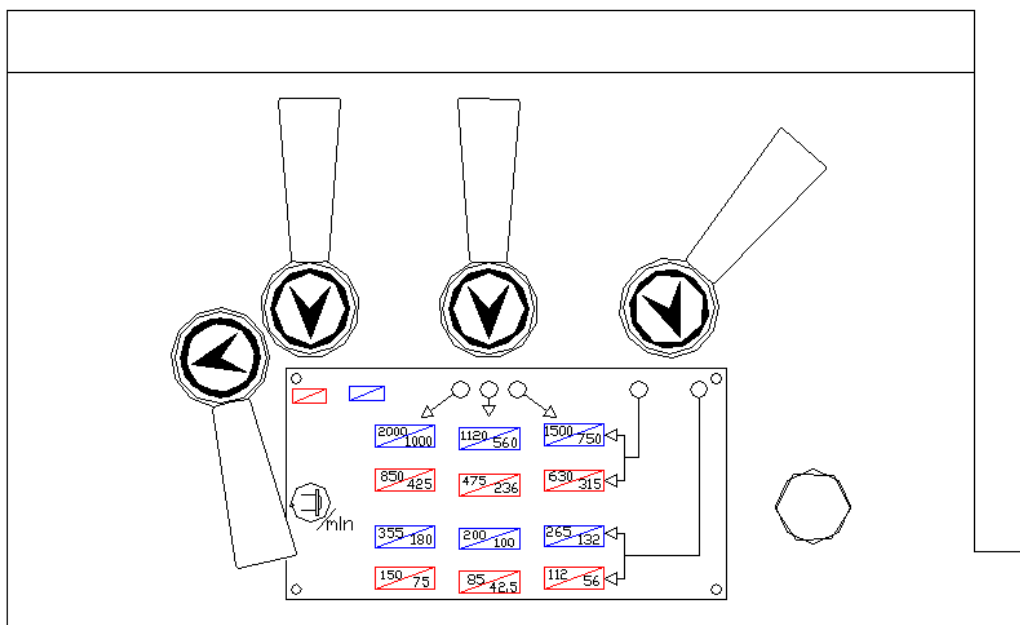


Fig.4-7 Double-speed drive motor

- **Apron:** By handle 43, Fig.4-2 the automatic feed drive is performed from the lead shaft and carriage mechanism. The carriage longitudinal feed or cross feed is controlled by handle 32, Fig.4-2 in compliance with the instructions on the plate, Fig.4-8.

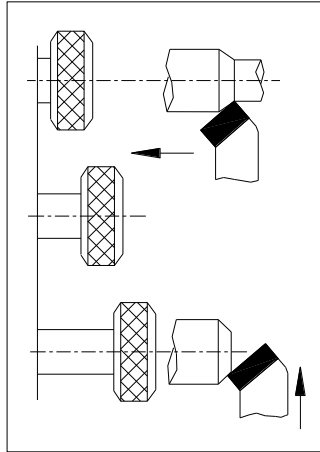


Fig.4-8

The carriage travel when threading is effected by the lead screw and apron half-nut . By handle 31, Fig.4-2 the half-nut engagement with lead screw is affected.

Between the handle for half-nut engagement and the handle for automatic feed is provided a protection device is provided so that one only to be effective at a moment.

When the half-nut is engaged the carriage control is by handle 22, Fig.4-1.

4.6 SETTING THE MACHINE FOR THREAD CUTTING

The machine can be set for cutting **metric**, **inch**, **module** and **diameter pitch** threads, as indicated on the plate located on machine front.

Procedure:

- Set the speed and speed range by handle 24, 25 and 26 Fig.4-1 in compliance with the plate of threads;
- By handle 18, Fig.4-1 set either left hand thread or right hand thread;
- In compliance with the plate for threads arrange the quadrant 11, Fig.4-3 change over gears ;
- By handle 28, Fig.4.1 set the multiplication mechanism in compliance with the plate for threads (1; 2; 3; 4; 5);
- By handle 29, Fig.4.1 set the selection mechanism in compliance with the plate for threads (1; 2; 3; 4);
- By handle 30, Fig.4-1 set the thread type;
- By handle 31, Fig.4-2 engage the half-nut to screw;

Besides above threads additional threads are also available , Fig.4-11 and Fig.4-12 and can be set same way as described above.

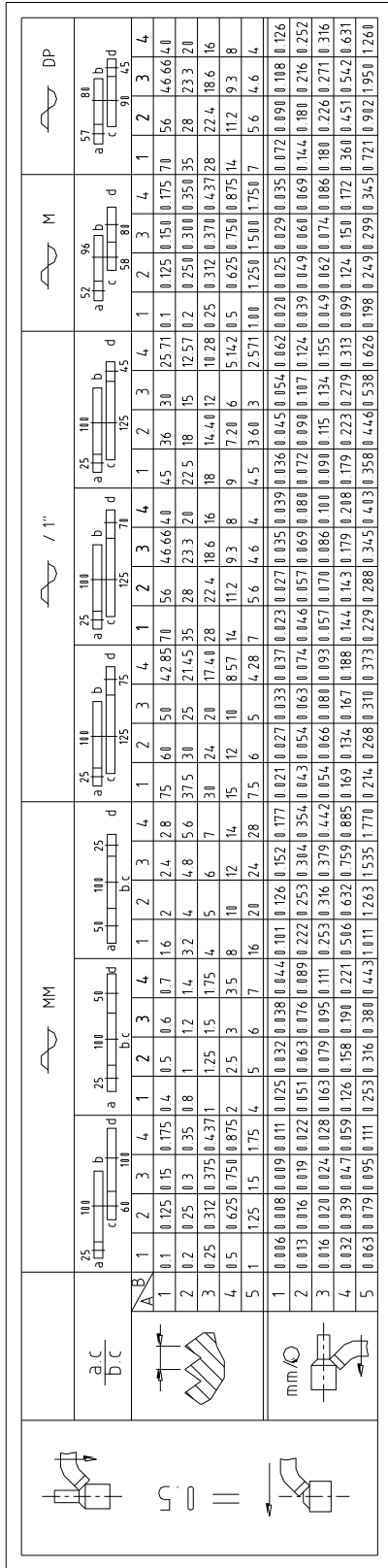


Fig.4-9 Metric version

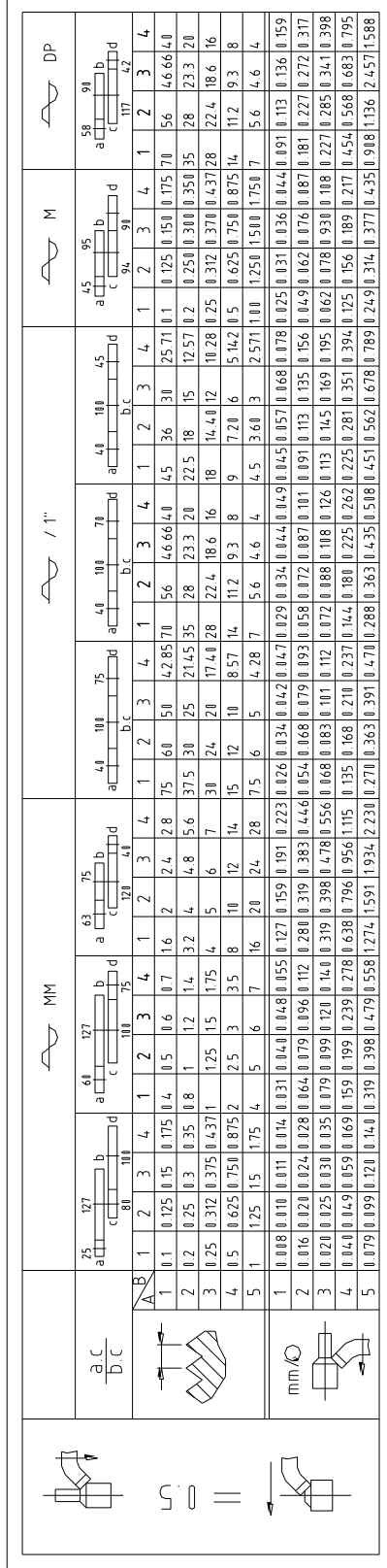


Fig.4-10 Inch version

TPI	CHANGE GEARS				A	B
	a	b	c	d		
11	40	100	80	44	4	1
11 ½	45	115	80	90	5	1
13	40	100	80	52	4	1
19	40	100		95	4	1
27	40	90	80	60	3	1
32	40	100		80	1	3
44	40	100		44	1	1
48	40	100		96	1	1
64	40	100		80	1	1
72	25	100		45	1	1
80	40	100		80	1	1

Fig.4-11 Metric version

TPI	CHANGE GEARS				A	B
	a	b	c	d		
11	40	100	80	44	4	1
11 ½	45	115	80	90	5	1
13	40	100	80	52	4	1
19	40	100		95	4	1
27	40	90	80	60	3	1
32	40	100		80	3	1
44	40	100		44	1	1
48	40	100		96	2	1
64	40	100		80	1	2
72	25	100		45	1	1
80	40	100		80	1	1

Fig.4-12 Inch version

4.7 MOUNTING OF CHUCKING AND DRIVE DEVICES

According to the customer order these machines can be delivered either according to DIN55027/ISO702-III spindle nose or USAS B-5.9-D1/ ISO702-II (Camlock) spindle nose.

4.7.1 MOUNTING A CHUCKING DEVICE ON SPINDLE NOSE (DIN55027/ISO702-III) FIG.4-13

When a chucking device has to be mounted on spindle nose as per Fig.4-13 turn the bayonet plate 1 clockwise (spindle forward) so that nuts 2 go through two-step hole splines of the bayonet plate. Fit the chucking device on spindle taper so that mounting bolts 4 and nuts 2 go through spindle holes and the round sleeve 5 aligns with the chucking device opening.

Then turn the bayonet plate counterclockwise and tighten nuts 2.

To dismount the chucking device proceed in opposite order.

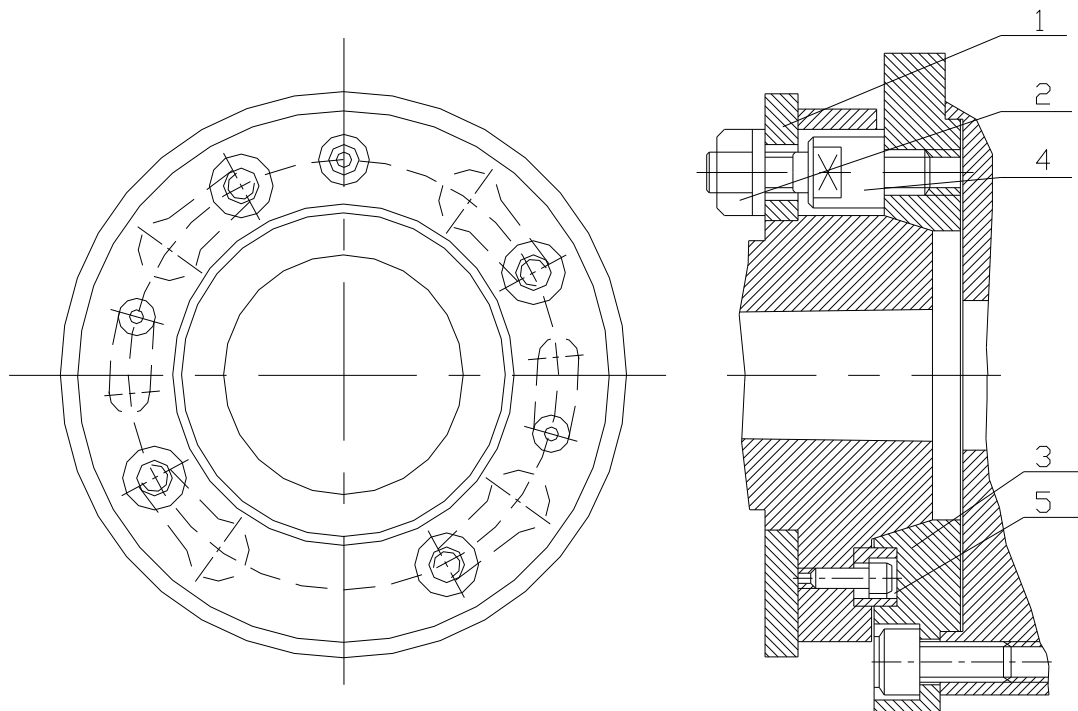


Fig. 4-13

4.7.2 MOUNTING A CHUCKING DEVICE ON SPINDLE NOSE (USAS B-5.9-D1/ISO702-II) (CAMLOCK), FIG. 4-14

Place the cams 2 (radial located on the spindle) on zero position so that cam and spindle markings align. Fit the chucking device 1 on spindle taper so that studs 4 go through spindle holes. The zero lines of chucking device and spindle shall also align.

Tighten cam 2 by turning them clockwise.

To dismantle the chucking device proceed in opposite order.

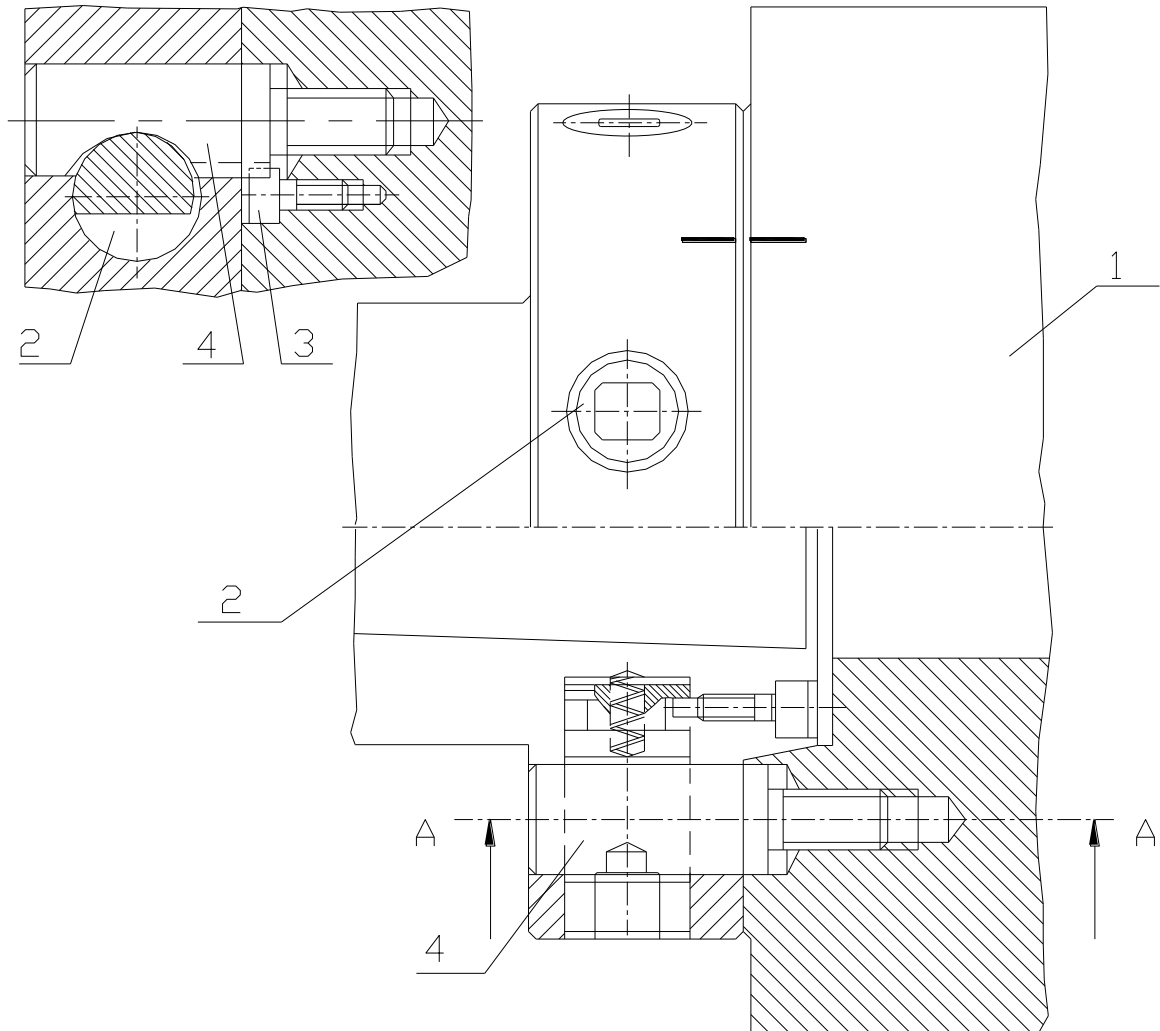


Fig. 4-14

Warning: When mount or dismantle chucking device **avoid impacts** on spindle or chucking device. Risk of serious damage .

Warning: For safety operation **never** exceed the chucking device maximum speed of rotation as marked on the chucking device or mentioned in the manufacturer instructions.

4.8 COOLANT SYSTEM

Fig.4-15

The coolant system serves to cool the cutting area and the cutting tool by splashing coolant liquid.

The coolant pump 1 deliver the coolant liquid from coolant tank 2 through hose 3 to a flexible pipe mounted on the carriage. By a tap 4 on the pipe the coolant flow rate can be adjust. Used coolant liquid directly flows back to coolant tank 2 from coolant basin 5.

An on/off switch on the control panel controls the coolant pump motor. It is recommended to switch off the coolant pump motor when tap 4 is closed.

Before and after operation with the coolant system clean and lubricate unpainted machine surfaces that may be attacked by a splashing liquid.

Allays use coolant that is not corrosive.

When the coolant system fail to deliver liquid or the flow rate decrease the cause must be found and eliminated. Mostly, the cause is non-following regular cleaning of the coolant system. When often operate with coolant system it is recommended cleaning the system at least once per 6-months. Also clean the coolant tank once per week and exercise regular analyse of the coolant liquid properties.

The selection of coolants shall be in compliance with the cutting conditions, material under machining and be safety for the operator.

Washing hands by coolant **not admitted** .

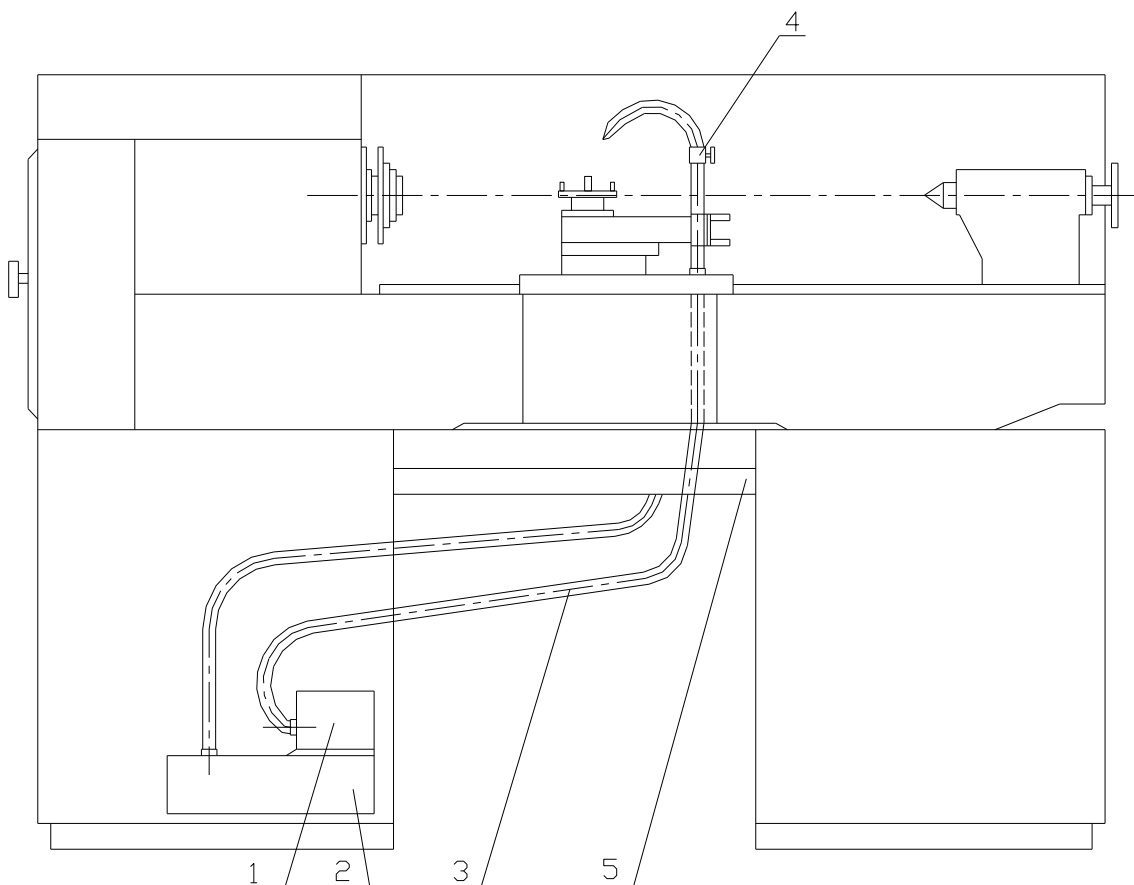


Fig.4-15

5 MACHINE LUBRICATION

5.1 GENERAL

Warning: This machine is shipped from factory **WITHOUT OIL** in gearbox, feed box and apron. Therefore, before machine start up gearbox, feed box and apron must be fill up with oil. All other machine parts must be also lubricated in compliance with the instructions in this section, Table 5-1 “Recommended lubricants” and Diagram 5-1 “Machine lubrication”.

5.2 GEARBOX LUBRICATION

5.2.1 GEARBOX LUBRICATION METHOD

Spindle system, gears and other mechanisms in the gearbox lubrication method is oil bath splashing.

5.2.2 FILLING THE GEARBOX WITH OIL

Lathe model	C8C	CU325
Oil viscosity grade	CL32 acc. DIN51502 or CB32 acc. ISO3498-1979	(See Table 5-1)
Quantity	1.25 Litre	1.25 Litre

5.2.3. OIL LEVEL

The oil level should be maintained in the middle of oil level indicator glass.

5.2.4. OIL LEVEL VERIFICATION AND OIL ADDITION

Before every machine start and 10 – 15 minutes after machine shut down verify the oil level on the oil level indicator glass.

If necessary, add oil to the middle of oil indicator glass.

Warning: Do not operate the machine if the oil level is below middle of oil level indicator glass. Also avoid excessive oil in the gearbox (over the middle of oil level indicator glass).

5.2.5. GEARBOX OIL CHANGE

Hint: To avoid oil splash when drain the oil from gearbox it is recommended to prepare o find suitable a chute of 1000 mm length. When oil drain put one side of the chute just under the gearbox drain hole while other end over a waste oil container or bucket

Recommended periods for gearbox oil change:

- First change: 10 – 15 workdays after machine start up.
- Second change: 20-30 workdays after first change.
- Then: in a 2 -3 work months periods.

Hint: It is recommended that before fill new oil wash the gearbox with suitable washing liquid commercially available.

5.3. FEED BOX LUBRICATION

5.3.1 FEED BOX LUBRICATION METHOD

The feed box lubrication method is by oil bath splashing.

5.3.2 FILLING THE FEED BOX WITH OIL

Lathe model	C8C	CU325
Oil viscosity grade	CL32 acc. DIN51502 or CB32 acc. ISO3498-1979 (See Table 5-1)	
Quantity	0,75 Litre	0,75 Litre

5.3.3. OIL LEVEL

The oil level should be maintained in the middle of oil level indicator glass.

5.3.4. OIL LEVEL VERIFICATION AND OIL ADDITION

Before every machine start and 10 – 15 minutes after machine shut down verify the oil level on the oil level indicator glass.

If necessary, add oil to the middle of oil indicator glass.

Warning: Do not operate the machine if the oil level is below middle of oil level indicator glass. Also avoid excessive oil in the feed box (over the middle of oil level indicator glass).

5.3.5 FEED BOX OIL CHANGE

Recommended periods for feed box oil change:

- First change: 10 – 15 workdays after machine start up.
- Second change: 20-30 workdays after first change.
- Then: in a 2 -3 work months periods.

Hint: It is recommended that before fill new oil wash the feed box with suitable washing liquid commercially available.

5.4 APRON, BED SLIDE WAYS, LEAD SCREW AND SHAFT LUBRICATION

5.4.1. METHOD OF LUBRICATION

Apron mechanisms are lubricated by oil bath splashing.

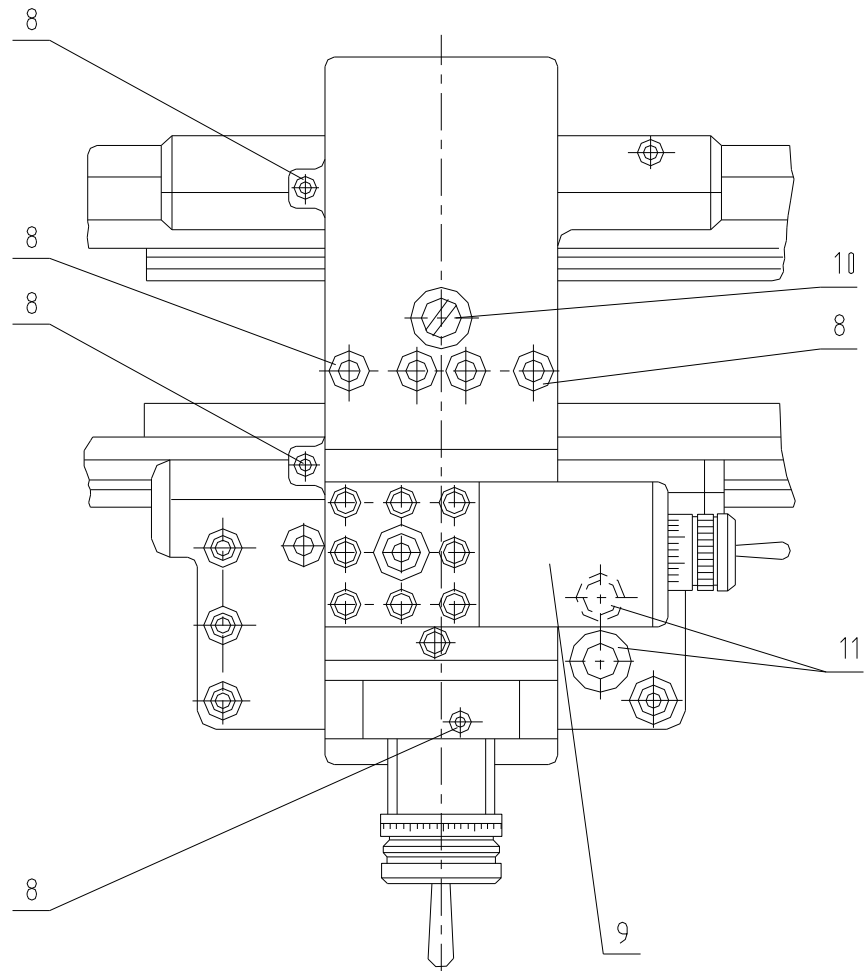


Fig.5-1

Bed slide ways and carriage are lubricated through oiler 8, Fig.5-1. Cross nut is lubricated from incorporated in the carriage. The oil container filling is through plug 10, Fig.5-1.

The lead screw lubrication is as following:

- 1st Version: from oil container that can be fill after removal of screw 11, Fig.5-1;
- 2nd Version: from oil container that can be fill when engage and disengage the nut to screw several times by handle 31, Fig. 4-2.

5.4.2 FILLING THE APRON WITH OIL

Lathe model	C8C	CU325
Oil viscosity grade	CL32 acc. DIN51502 or CB32 acc. ISO3498-1979 (See Table 5-1)	
Quantity	0,5 Litre	0,5 Litre

5.4.3 OIL LEVEL

The oil level should be maintained in the middle of oil level indicator glass.

5.4.4. OIL LEVEL VERIFICATION AND OIL ADDITION

Warning: Since apron oil decrease faster due to the reason that beside lubrication the apron mechanisms it oil also lubricate the screw. Therefore, the level should be verify every day on the apron oil level indicator glass.

5.4.5. OIL CHANGE

Recommended periods for apron oil change:

- First change: 10 – 15 workdays after machine start up.
- Second change: 20-30 workdays after first change.
- Then: in a 2 -3 work months periods.

Hint: It is recommended that before fill new oil wash the apron with suitable washing liquid commercially available.

5.5 LEAD SCREW AND LEAD SHAFT BEARINGS LUBRICATION

The bearings are factory greased. Grease change is recommended after repair or change a bearing.

5.6 LUBRICATION THE SLIDING SURFACES OF UPPER CARRIAGE, LOWER CARRIAGE, COMPOND AND SLIDES

In compliance with Table 5-1. “Recommended lubricants” and Diagram 5-1. “Machine lubrication” the operator must daily lubricate by oilcan through respective oilers.

5.7 LUBRICATION THE DIAL OF CARRIAGE CROSS FEED

The dial on the carriage cross feed should be periodically lubricated through oiler 8, Fig.5-1 and in compliance with Table 5-1 “Recommended lubricants” and Diagram 5-1 “Machine lubrication”

5.8 TAILSTOCK LUBRICATION

The tailstock quill and screw are daily lubricated by oilcan through respective oilers and in compliance with Table 5-1. “Recommended lubricants” and Diagram 5-1. “Machine lubrication”.

5.9 QUADRANT LUBRICATION

The quadrant change over gears should be grease lubricated once a month. However, when operate the machine under damp tropical environment it is recommended to cover entire surface of the gears with grease.

5.10 RECOMMENDED LUBRICANTS

GRADE	MANUFACTURER AND BRAND NAME		
	MOBIL	SHELL	ESSO
CB 32 ISO3498-79	MOBIL VACTRA	TELLUS OIL 32	TERESSO 32
	OLI LIGHT	TELLUS OIL C32	NUTO 32
G 68	MOBIL VACTRA	TONNA OIL T68	FEBIS K68
	OIL No. 2	TONNA OIL TX68	
X M 2	MOBIL PLEX 47	ALVANIA GREASE R2	BEACON 2
		SUPER GREASE R2	ESSO GP GREASE
GRADE	MANUFACTURER AND BRAND NAME		
	BRITISH PETROL	CASTROL	VALVOLINE
CB 32 ISO3498-79	ENERGOL CS32	MAGNA 32	CIR 32
		PERFECTO I32	
G 68	MACCURAT 68	MAGNA BC68	GES 68
	ENERGOL GHL68	MAGNA BSX 68	
X M 2	GREASE LTX2	SPHEROL APT2	L2 EP GREASE
	GREASE LTX2-EP	SPHEROL EPL2	
GRADE	MANUFACTURER AND BRAND NAME		
	Q8	TAMOIL	CHEVRON
CB 32 ISO3498-79	VEEDI 32	INDUSTRIAL OIL 32	CIRCULAN OIL 46
			GST OIL46
G 68	WAGNER	TANWAY OIL 68	VISTA OIL 68X
X M 2	REMBRAN P2	TAMILITH GREASE 2	DURALITH
		TAMILITH GREASE 2EP	GREASE EP2

Table 5-1. Recommended lubricants

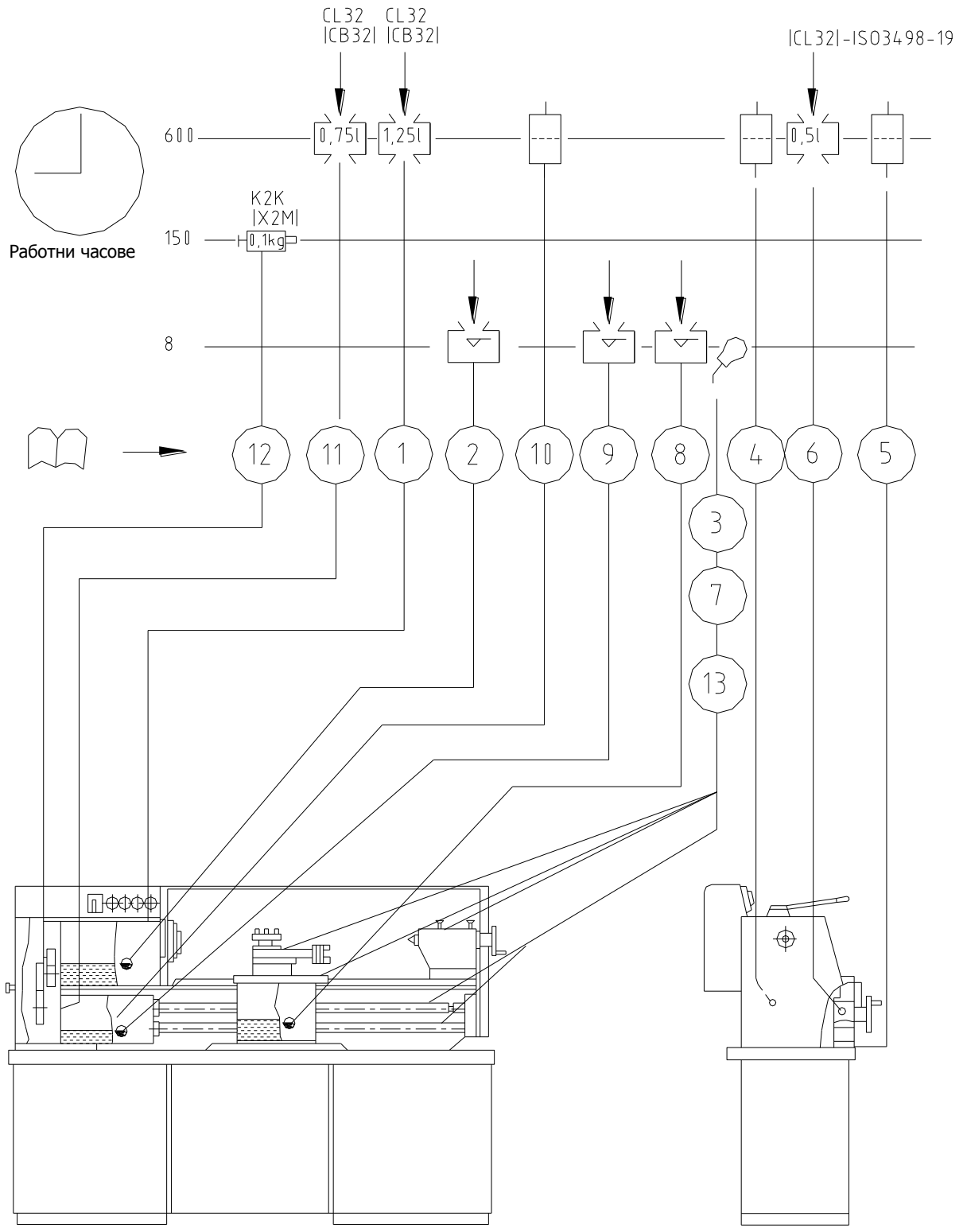


Diagram 5-1. Machine lubrication

6 MACHINE MAINTENANCE

6.1 MACHINE LUBRICATION

The lubrication is of great importance for machine trouble free operation and long life.

Machine lubrication and oil change must be strictly observed as instructed under section 5. "Machine lubrication".

6.2 ADJUSTMENTS

All machine mechanisms are factory adjusted and tested. However, after a long time of operation or after repair works some mechanisms or machine parts have to be checked and properly adjusted.

6.2.1. ADJUSTMENT THE CLUTCH FOR FORWARD AND REVERSE ROTATION

The forward and reverse spindle rotation double-stack clutch type "Sigma" (See Fig.6-1) contains two disc stacks "A" and "B" located each side of shifting ring 1. Disc stack "A" (close to V-belt pulley) serves to transmit forward rotation to spindle and disc stack "B" (far from V-belt pulley) serves to transmit reverse rotation to spindle.

Between-disk clearance is factory adjusted so that full rotation torque is transmitted to spindle without idle slippage between discs. However, it may be necessary to adjust the clearance between discs resulted from normal disc wear so that no idle slippage occurs when transmitting the rotation torque to spindle.

Procedure:

- Switch off the power supply from electric cabinet main disconnecter.
- Remove the cover from gearbox top.

Adjustment the between-disc clearance on disc stack "A" (spindle forward rotation)

- Pull and turn at 90° the fixer 2 that secure adjusting nut 3 to pressing disc 4. At this position the adjusting nut 3 should be free from the pressing disc and can be turned for adjusting.
 - Into one of the adjusting nut 3 holes insert a metal rod $\varnothing 5$. Turn the nut in direction from machine to you as much as necessary to eliminate the excessive between-disc clearance.
 - When the excessive clearance is eliminated (up to you) pull back fixer 2 so that it just set up its place and proper secure adjusting nut 3 to the pressing disc 4. If necessary, you can make it easier by shifting the clutch to stack "B" first, then manually turn V-belt pulley.

<p>Warning: Before machine start it is important to verify if the fixer 2 is properly set on its place and secure adjusting nut 3 to pressing disc 4.</p>
--

Verification of the adjustment

- Switch on the power supply and start the motor;
- Set the clutch control lever for spindle forward rotation and verify the following:
 - i. If the clutch control lever can be moved easy and the spindle smoothly starts forward rotation means that between-disc clearance is correct adjusted;
 - ii. If however, the clutch control lever cannot be easy moved and the spindle starts harshly (with a jerk) forward rotation means that the clutch discs are tightened and shall be fast wear out. In this case it is necessary to loose the discs to some extent by turning the adjusting nut 3 backward so that described in “i” above effect be achieved.

Adjustment the between-disc clearance on disc stack “B” (spindle reverse rotation)

- The adjustment procedure is same as described for disc stack “A” above with the only exception that the adjusting nut 3 must be turned in direction from you to the machine.

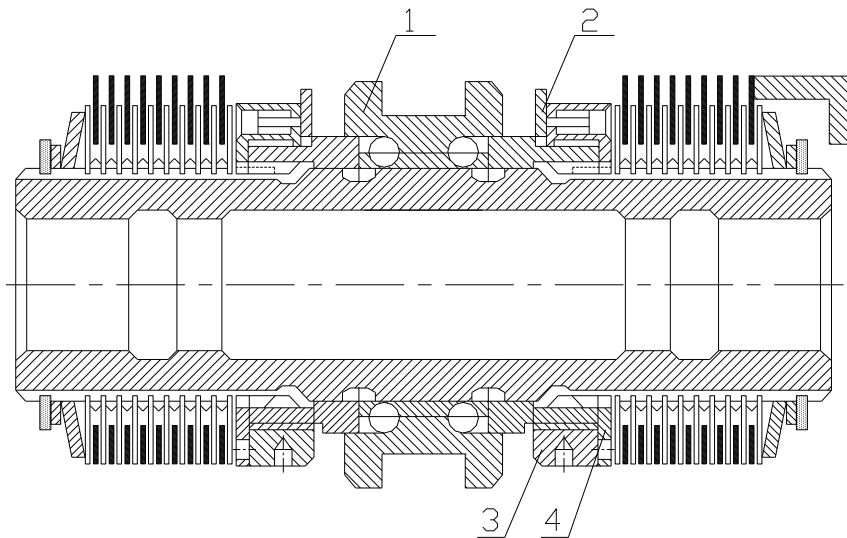


Fig.6-1. Clutch for spindle forward and reverse rotation

6.2.2 BAND BRAKE ADJUSTMENT

Band brake adjustment is necessary if after setting the clutch control lever in middle position (clutch inactive) the brake does not stop spindle within limited time or after replacement wear out brake band.

Adjustment procedure for Model C8C (See Fig.6-2)

- Switch off the power supply from electric cabinet main disconnecter.
- Remove the cover from gearbox top.
- Loose adjusting nuts 4 so that the excessive clearance between band linen 3 and brake drum be eliminated;
- Spring 5 provides the pressure required.
- If linen 3 found wear out it must be changed by new one.

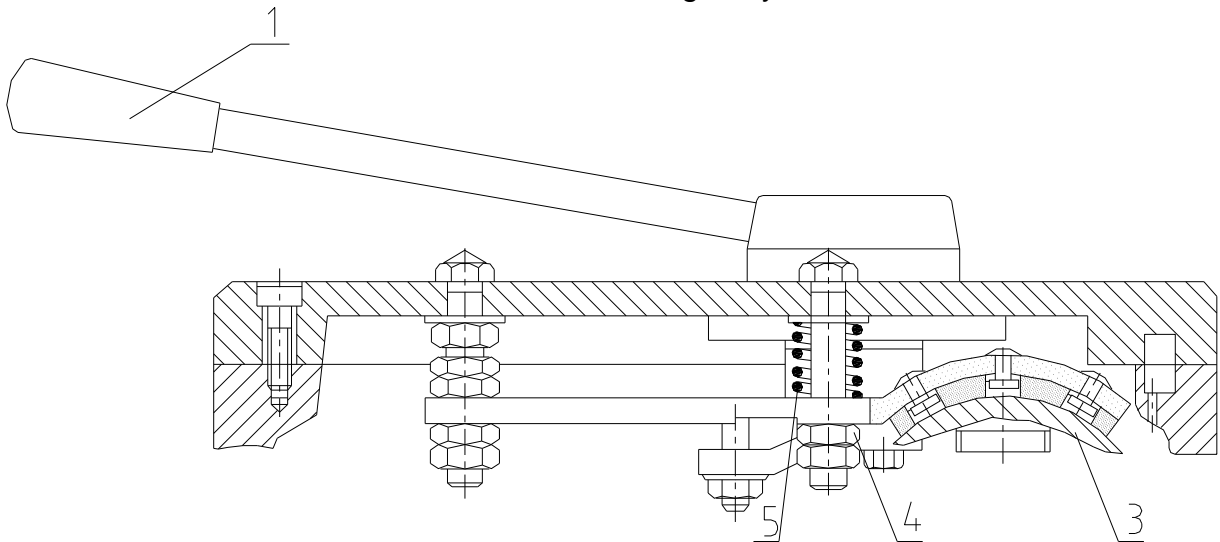


Fig.6-2 Band brake adjustment

Verification of the adjustment

Dismount the universal chuck from the spindle and check to verify that:

- When the clutch control lever is set on middle position spindle (without chuck) stops running at maximum speed within 6 – 7 seconds.

Warning: Do not tighten the band so that no clearance exists between the band 3 and brake drum 4 that may lead to fast wear out and heat generation.

⋮

Adjustment procedure for Model CU325 (See Fig.6-3)

- Switch off the power supply from electric cabinet main disconnect;
- Remove the screw that fix electric cabinet right side to gearbox;
- Swing the cabinet out of gearbox side;
- Remove 6 mounting screws from the lid that cover the opening for access to the band brake. Remove the lid;
- Loose lock nut 1;
- Tighten adjusting nut 2 as much as necessary to eliminate the excessive clearance between band 3 and brake drum 4.
- Tighten lock nut 1 so that adjusting nut 2 is properly locked.

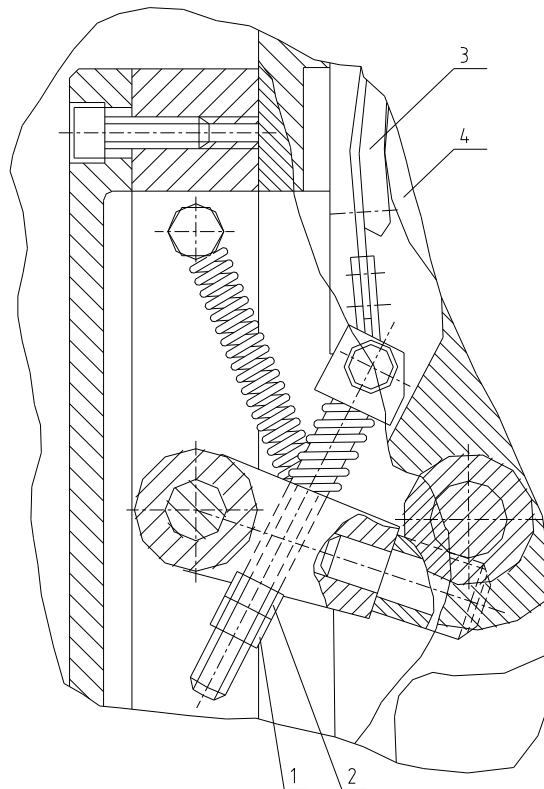


Fig. 6-3. Band brake adjustment

Verification of the adjustment

Dismount the universal chuck from the spindle and check to verify that:

- When the clutch control lever is set on middle position spindle (without chuck) stops running at maximum speed within 6 – 7 seconds.

Warning: Do not tighten the band so that no clearance exists between the band 3 and brake drum 4 that may lead to fast wear out and heat generation.

6.2.3. ADJUSTMENT THE CLEARANCE BETWEEN LOWER CARRIAGE CROSS SCREW AND NUT (See Fig.6-4)

Procedure:

For access to adjusting nut 1 and lock nut 2 is available after removal plug 3 located on lower carriage.

- Loose lock nut 2;
- Tighten adjusting nut 1 as much as a normal clearance in the screw assembly be achieved;
- Tighten lock nut 2;
- Replace plug 3 .

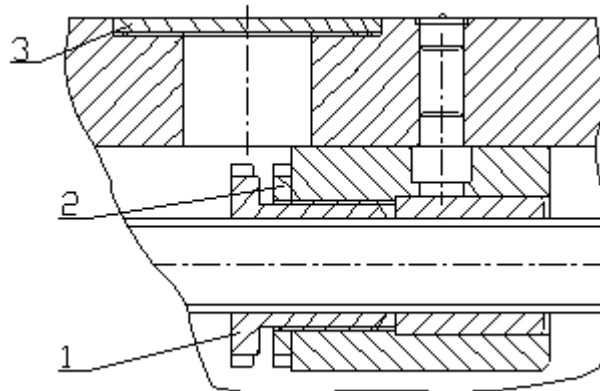


Fig.6-4. Lower carriage cross screw and nut adjustment

6.2.4. ADJUSTMENT THE CLEARANCE BETWEEN THE LEAD SCREW AND NUT (See Fig. 6-5)

Method 1: (See Fig.6-5)

Procedure:

- Remove plug 1 located on the hub of handle 2 . Loose lock nut 3 and nut 4;
- Set handle 2 on position for half-nut engagement to lead screw;
- By nut 4 adjust the clearance between lead screw 6 and half-nut 5 so that lead screw motion be ensured;

Note: During adjustment procedure the lead screw must be disconnected from the feed box so that the motion may be verified manually.

- Tighten lock nut 3.

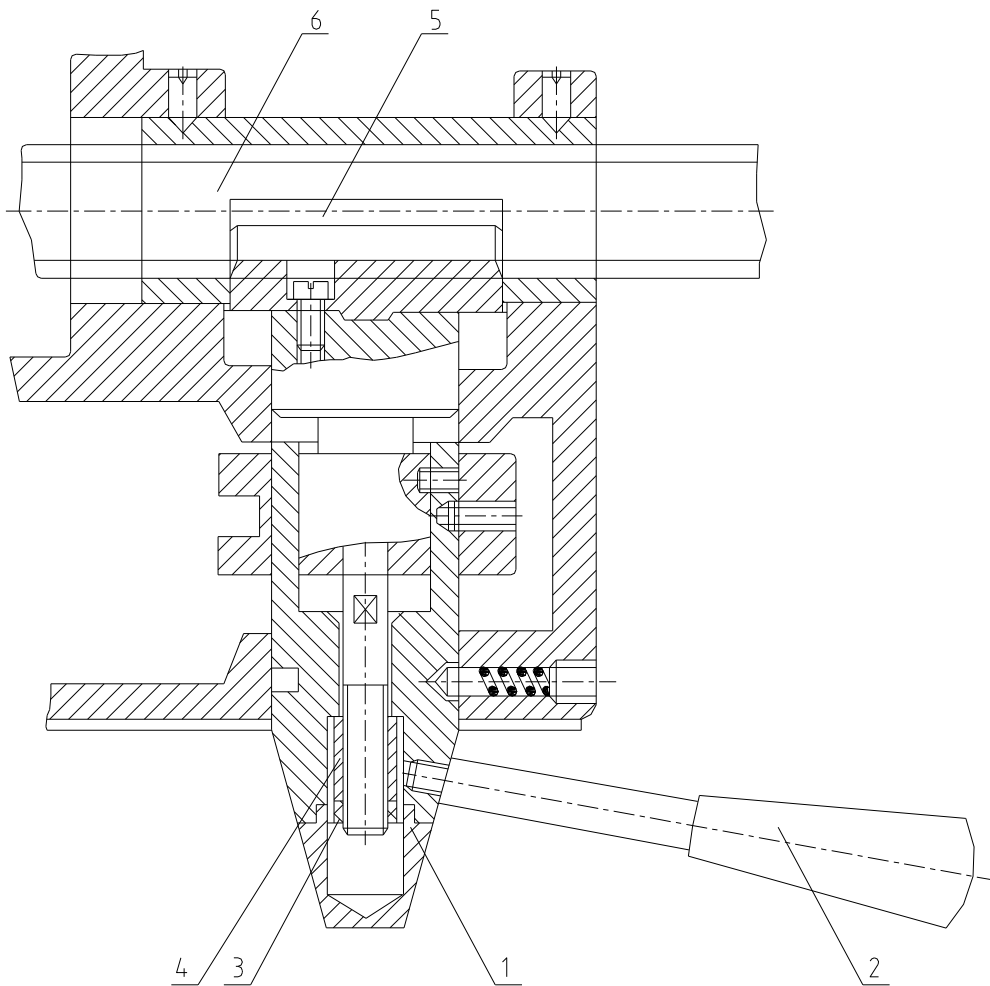


Fig.6-5

Method 2: (See Fig.6-6)

Procedure:

- Loose by 3 – 4 turns the lock nut 2 and screw 3 ;
- By handle 1 engage the half-nut 5 ;

Note: During adjustment procedure the lead screw must be disconnected from the feed box .

- Tighten screw 3 as much as necessary to ensure lead screw 6 motion;
- Tighten lock nut 3.

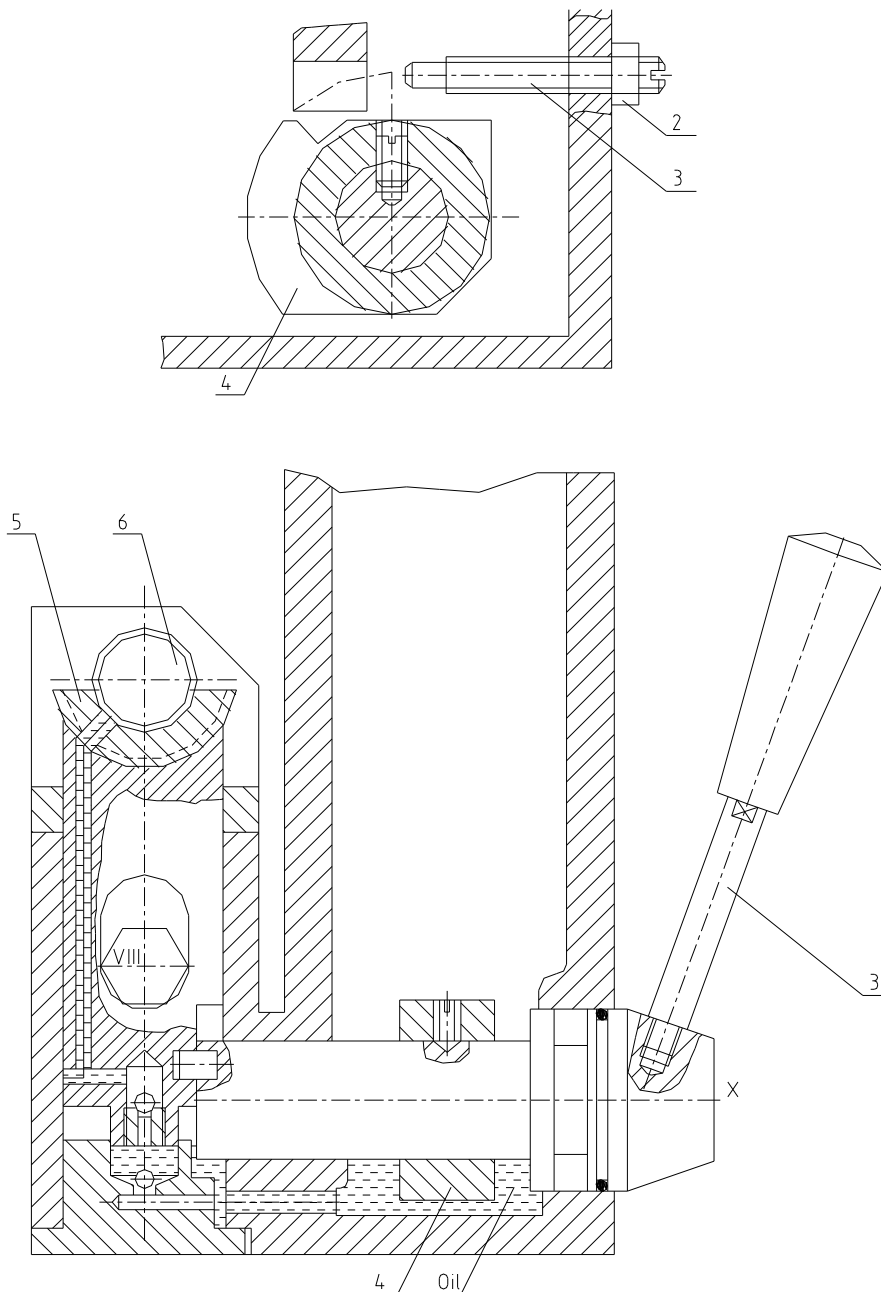


Fig.6-6

6.2.5. ADJUSTMENT THE CLEARANCE BETWEEN BED SLIDEWAY AND CARRIAGE BASE PLATE (See Fig.6-7A and Fig.6-7B)

ADJUSTMENT THE CLEARANCE FROM “V” SLIDE WAY SIDE (See Fig.6-7A)

Procedure:

- Loose bolt 1 until plate 2 is free;
- .Fit plate 2 surface “A” so that after tighten plate 2 with bolt 1 desired clearance between plate 2 and lower plane of bed slide way is achieved;

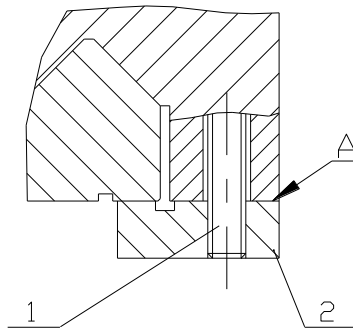


Fig.6-7A. Adjustment the clearance from “V” slide way side

ADJUSTMENT THE CLEARANCE FROM “FLAT SLIDE WAY” SIDE (See Fig.6-7B)

Procedure:

- Loose locknuts 3;
- By tighten bolts 4 desired clearance between plate 5 and lower flat plane of bed slide way is achieved;
- When desired clearance is achieved tighten locknuts 3.

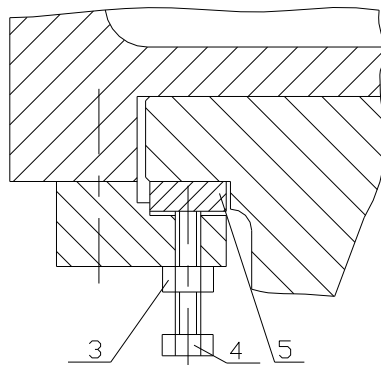


Fig.6-7B. Adjustment the clearance from flat slide way side

Verification of the adjustment

- When manually turn the hadwheel for carriage longitudinal traverse the carriage must move smooth and without resistance.

6.2.6. ADJUSTMENT THE CLEARANCE BETWEEN LOWER SLIDE AND CARRIAGE BASE PLATE (See Fig.6-8)

The clearance between the sliding surfaces of lower slide 1 and carriage base plate 2 is adjusted by gib 3.

Use same method to adjust the clearance between upper slide and compound.

Procedure

- To prepare the gib 3 for adjustment procedure loose fixing screw 4 from slide rear side.
- To achieve the desired clearance tighten screw 5 as much as necessary;
- After adjustment fix the gib 3 by tighten lock screw 4;

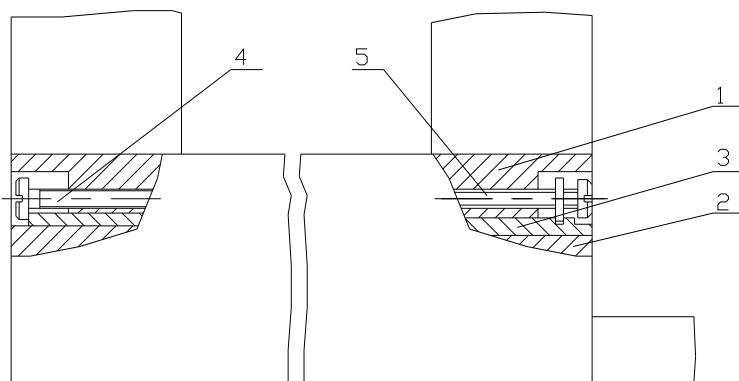


Fig.6-8 Adjustment the clearance between lower slide and carriage base plate

Verification of the adjustment:

- Check by gap gage the clearance between contact surfaces of lower slide and carriage base plate . The clearance measured should not be greater than 0,03 mm ;
- The carriage motion should smooth and easy .

6.2.7 TAILSTOCK SIDE DISPLACEMENT (See Fig.6-9 and Fig.6-10)

When a long workpiece with a long taper shape to be machined the tailstock upper part can be displaced sidwise in relation to lower part 5. The displacement value is read out on a scale located on tailstock rear side. One graduation of the scale is equal to 1 mm displacement to the left or right.

Procedure:

- Unclamp the tailstock by handle 1;
- Loose screw 2;
- When adjusting screw 3, Fig.6-10 is screw in or screw off the tailstock upper part moves to the front or rear guide prisms i.e. left or right from the scale zero;
- When the desired displacement is set then tighten screw 2 to fix it.

Warning: After operation with tailstock displaced sidwise it is of grate importance to recover the initial setting. Also measure by dial indicator and arbor to ensure exact alignment between tailstock and headstock.

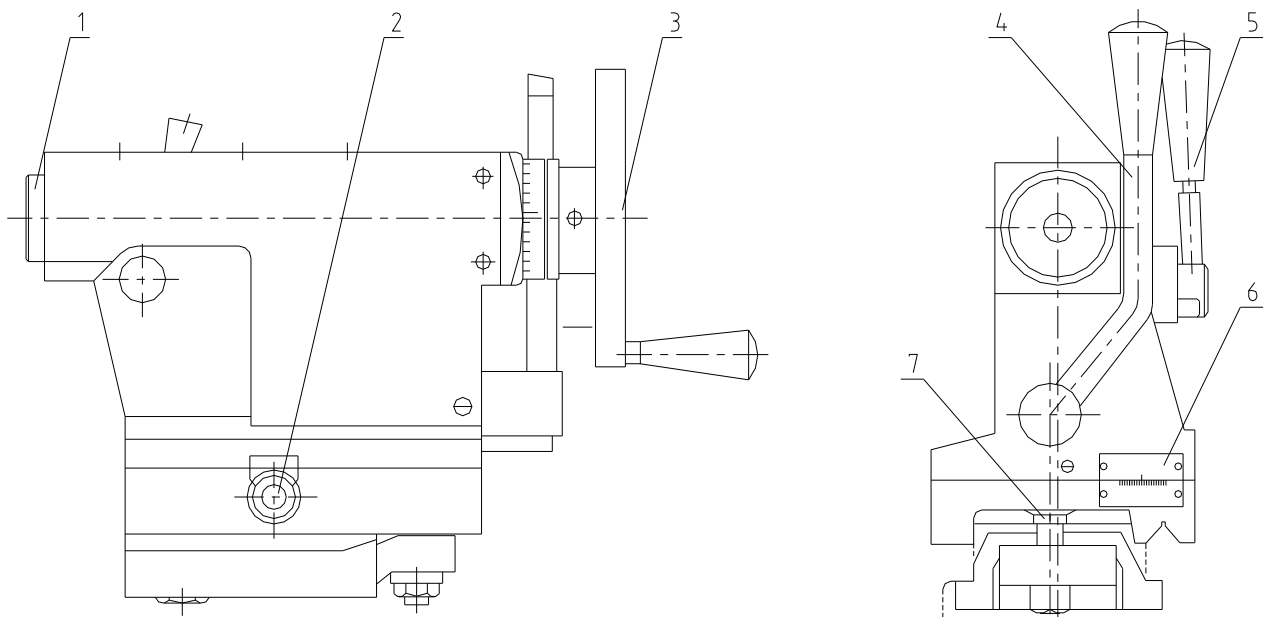


Fig.6-9. Tailstock sidwise displacement

6.2.8 ADJUSTMENT THE LEAD SCREW AXIAL CLEARANCE (See Fig.6-11)

Procedure:

- Loose locknut 2;
- By turning nut 3 the clearance of bearings 5 is adjusted;
- Tighten locknut 2.

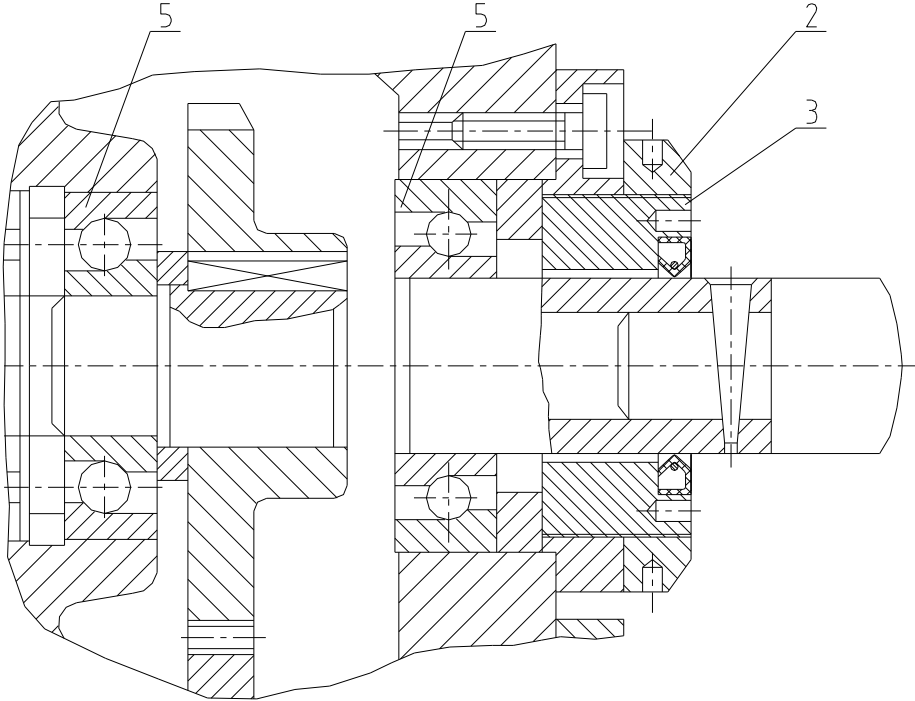


Fig.6-11. Adjustment the lead screw axial clearance

6.2.9. CHANGE THE SHARE PIN ON FEED BOX OUTPUT SHAFT (See Fig.6-12)

The share pin 1 serves as a protection that is shared when dangerous overloud occurs and it terminates the motion transmission from feed box to carriage. When it occurs it is necessary to change the share pin with a spare one. For the purpose the machine is delivered with 2 share pins as standard spare parts.

Procedure:

- Loose screw 5;
- Remove washer 4 and bushings 2 and 3;
- Drift the share pin 1 out of the shaft;
- Drift the share pin 1 out of bushing 3;
- Fit bushing 3 on the shaft;
- Fit the spare share pin1 into place;
- Replace bushing 2 and washer 4and tighten screw 5.

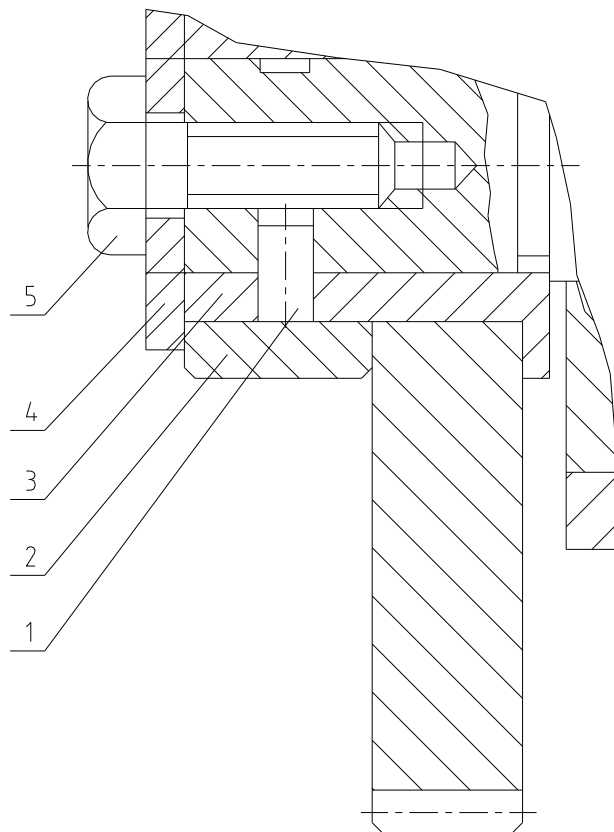


Fig.6-12

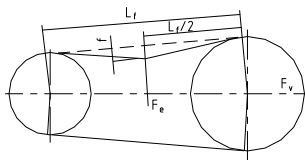
6.2.10.ADJUSTMENT THE MAIN DRIVE V-BELTS TENSION (SEE FIG.6-13)

The tension of main drive V-belts are factory adjusted. However, after machine start up and after several hours of operation it is recommended to check the V-belts tension and adjust if necessary.

V-belts tension adjustment also required after V-belts change.

It is recommended to verify the V-belts tension in a month time machine operation and adjust if necessary.

Warning: Please, have in mind that if one only belt is found damage the full set must be change. The new V-belts are mount on the V-belt pulleys manually . Do not use tools that may damage the V-belts.



$$F_e = 100-150N$$
$$f = L_f/100 \approx 6MM$$

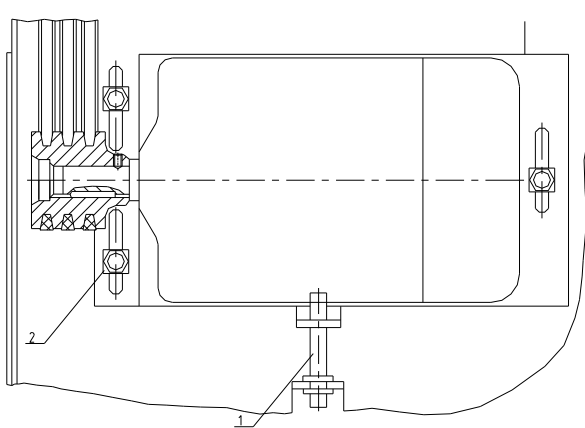


Fig.6-13. Adjustment the main drive V-belts tension

Procedure

- Remove the lid from machine foot under the gearbox to access the V-belts;
- Slightly loose bolts 2 fixing the motor mounting plate;
- Adjust the V-belts tension by tighten screw 1;

Warning: Do not over tight the V-belts. Any V-belts over tight leads to fast wear out of them, overload of motor and gearbox input shaft bearings.

• After adjustment the V-belts correct tension tighten bolts 2 to fix the motor mounting plate.

Verification of the adjustment

• When start the machine at high speed verify that no V-belts slippage occurs or generation of strange noise.

7 ELECTRIC EQUIPMENT

7.1 GENERAL

This machine is equipped with main drive motor, coolant-pump motor, electric board and cabinet, control panel with controls, work light wiring cables, safety devices, etc.

The electric installation and electric cabinet board, main drive motor power and power supply rating is in compliance with customer order.

All motors are 3-phase, asynchronous.

The control circuit supply is from a transformer of secondary 24V and frequency in compliance with customer order.

The work light is 12V in compliance with safety norms.

For details about the machine electrical equipment and wiring refer to the electrical documentation attached to this manual.

7.2 SHORT-CIRCUIT PROTECTION

- The main drive motor and coolant-pump motor are protected against short circuit by circuit breakers (in the electric cabinet) and against overload by a maximum current protection (bi-metal thermal relays) FT1, FR1;
- The transformer (TC) is protected by fuses FU1 ... FU4.

7.3 MISCELLANEOUS PROTECTIONS

For mechanical and electrical protection this machine is provided by following micro switch interlocks:

- Micro switch on electric cabinet door **SQ₁**
- Micro switch on chuck guard **SQ₃**
- Micro switch on the clutch **SQ₄**
- Micro switch on quadrant compartment door **SQ₅**
- Emergency stop pushbutton (red mushroom) on the control panel located on gearbox **SB₀**
- Emergency stop pushbutton (red mushroom) located on the rear guard for machine 1000mm DBC **SB₅**
- The electric installation and all electric components are incorporated in the machine so that are protected against mechanical, weather or chemical damage.
- The machine is provided by a protection against main drive motor restart under condition that spindle is not turned off (**SQ₄** off).
- If ordered by the customer this machine can be delivered with an extra emergency stop pedal (option). **SQ₂**

7.4 MAINTENANCE

Warning: Access to electric cabinet is only admitted to qualified electrician or authorized by the owner person duly instructed for safety works with high voltage. Electric cabinet checks and repair works may be only performed after disconnecting the power supply from electric cabinet main disconnectors **QS₀**, and after following tests for lack of voltage.

7.4.1 CHECKS

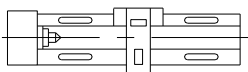
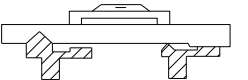
For safety operation with the machine following periodical checks must be observed:

- Machine neutral (ground) in compliance with local norms for electric safety and if do not confirm take measures to eliminate the cause before machine start;
- Connection condition of all wires and cables and if find loose must be tighten;
- The condition and function of micro switch interlock on electric cabinet door (**SQ₁**), on chuck guard (**SQ₃**), on clutch (**SQ₄**), on quadrant compartment door (**SQ₅**) and both emergency stop pushbuttons (red mushroom) (**SB₀**) and (**SB₅**).

8 PROTOCOL FOR GEOMETRICAL ACCURACY

Machine Tools Lathes of Normal Accuracy Swing up to 800mm Acceptance Conditions		DIN 8607
Type:	Machine number:	
Recipient:	Order number:	
Date:	Customer:	

8.1. PREPARATORY MEASURES

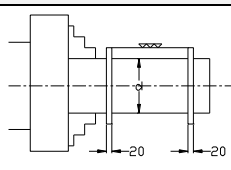
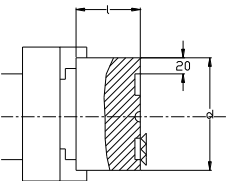
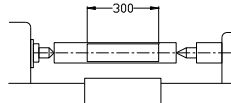
No	Object of testing	Diagram	Test apparatus	Test instructions	Variations	
					permissible	measured
O1	Verification of levelling a) in longitudinal direction		Precision level. Optical or other methods. Accessories (parallels measuring bridge etc.) Suited to the type of slide way	Carriage at middle of bed. Make the measurements at a number of positions equally spaced along the entire length of the bed. a) Place the level on the front or rear slide ways.	a) 0.01 mm for L up to 500mm (convex) Local tolerance: 0.02mm for L up to 1000mm (convex) Local tolerance: 0.0075mm up to 250mm. If turning length exceeds 1000mm the permissible variation increase is to be increased by 0.01mm each additional 1000mm (convex). Local tolerance: 0.015mm up to 500mm	a).....mm for L up tomm for L up to
	b) in transverse direction		See O1 a)	b) Place level on measuring bridge (straightedge). For both measurements the level may also be placed on the transverse slide or carriage.	b)0.04mm/m Change in inclination	b)....mm/m

8.2 GEOMETRICAL TESTINGS

No	Object of testing	Diagram	Test apparatus	Test instructions	Variations	
					permissible	measured
G1	Straightness of carriage movement in the horizontal plane or in the plane defined by the axis of the centers and the tool point		a) L up to 1500mm Dial indicator according to DIN 879. Test mandrel or straightedge 300 up to 500mm long b) for any turning length Test wire and microscope or optical methods	a) Mount test mandrel between centers, Dial indicator on carriage. Stylus bearing in the horizontal plane against the test mandrel. Traverse carriage along the test mandrel. b)-Attach test wire at tailstock, pass it over a pulley at the end of the bed and tension with a weight. Microscope on carriage. Line up the test wire at c and d by means of cross wires of the microscope. Traverse carriage along the wire	a) and b) 0.015mm L up to 500mm 0.02mm L over 500mm up to 1000mm If the turning length exceeds 1000mm, the permissible variation is to be increased by 0.005mm for each additional 1000mm, but without exceeding 0.03mm	a)mm b).....mm
G2	Parallelism of carriage movement and tailstock guides a) in the horizontal plane b) in the vertical plane		Dial indicator according to DIN 879	Dial indicator on carriage; stylus in contact with tailstock quill. The quill must be run out to a sufficient distance and locked as under normal working conditions Traverse carriage and tailstock jointly over the full length of the bed.	a) and b.) 0.03mm L up to 1500mm Local tolerance 0.02mm by 500mm a) and b) 0.04mm L over 500mm Local tolerance 0.03mm by 500mm	a).....mm b).....mm mmmm
G3	a) Operating spindle axial run-out b) Movement accuracy in relation to face plane		Dial indicator according to DIN 879 (Auxiliary measurement aid)	Dial indicator: a) on spindle axis b) on spindle face plane Slowly rotate spindle. In the event of play in the trust bearings, apply constant force F. The value of F is be specified by the manufacturer.	a) 0.01 mm b) 0.02mm (including axial run-out)	a).....mm b)..... mm
G4	Run out of spindle nose centering taper		Dial indicator according DIN 879.	Apply the dial indicator at right angles to the circumference of the taper. Slowly rotate spindle. In the event of play in the trust bearings, apply constant force F. The value of F is be specified by the manufacturer.	0.01mmmm
G5	Run out of internal taper of spindle a) at spindle nose b) at a distance equal to half the maximum turning diameter, subject to maximum of 300mm		Dial indicator according DIN 879. Test mandrel with mounting taper	Test mandrel in internal taper. Apply dial indicator to circumference of test mandrel. Rotate spindle. Measure at a, then at b.	a)0.01mm b)0.0mm for a measuring length of 300m	a)..... mm b).....mm
G6	Parallelism of spindle axis with carriage movement over a length equal to half the maximum turning diameter, subject to a maximum of 300mm a) in the horizontal plane b) in the vertical plane		Dial indicator according DIN 879. Test mandrel with mounting taper	Test mandrel in the internal taper of spindle. Bring to mid-way position of run out. Bring stylus into contact with circumference of test mandrel. Traverse carriage through the test distance; sequence of measurement as for G5.	a) 0.015mm by 300mm directed towards tool point b) 0.02mm by 300mm directed upwards	a)mm b)mm

No	Object of testing	Diagram	Test apparatus	Test instructions	Variations	
					permissible	measured
G7	Parallelism of tailstock quill axis with carriage movement. a) in horizontal plane b) in vertical plane		Dial indicator according DIN 879	Bring dial indicator into contact with retracted and locked tailstock quill at c. Advance quill through 100mm and re-lock. Traverse carriage to d. Measure at position c, then at d.	a) 0.015mm by 100mm directed towards tool point. b) 0.02mm by 100mm directed upwards.	a)mm b).....mm
G8	Parallelism of mounting taper in tailstock with carriage movement.a. a) in horizontal plane b) in vertical plane		Dial indicator according DIN 879. Test mandrel with mounting taper	Test mandrel in retracted and locked tailstock quill. Bring dial indicator stylus into contact at c and traverse carriage along test mandrel.	a) 0.03mm by 300mm directed towards tool point. b) 0.03mm by 300mm directed upwards	a)mm b)mm
G9	Equidistance of headstock and tailstock centers above reference plane.		Dial indicator according DIN 879. Test mandrel mounted between centers.	Tailstock and tailstock quill locked. Bring dial indicator into contact with top generatrix. Measure at both ends of the mandrel. l	0.04mm (Tailstock center higher)mm
G10	Parallelism of spindle axis with longitudinal movement of upper slide.		Dial indicator according DIN 879. Test mandrel with mounting taper	Align upper slide guides parallel with spindle axis in the horizontal plane. Lock the carriage. Mount test mandrel in the internal taper and bring to mid-way position of run-out. Traverse upper slide with dial indicator attached thereto, the travel provided.	0.04mm by 300mmmm
G11	Squareness of spindle axis to movement of cross slide.		Dial indicator according DIN 879. Test plate or straightedge fixed to spindle.	Dial indicator mounted on cross slide. Test plate or straightedge fixed to spindle.. Traverse cross slide through mm	0.02. mm by 300mm Error in the direction $\alpha \geq 90^\circ$mm
G12	Spindle axial run out.		Dial indicator according DIN 879. Steel ball according to DIN 5401	Bring dial indicator into contact with steel ball in center of lead screw. Using lead screw traverse carriage in both directions. This measurement may be disregarded if the practical testing P3 (working accuracy) is carried out.	0.015mm in each directionmm
G13	Measurement of pitch accuracy. a) generated by lead screw movement b) measured on lead screw		a) Dial indicator according DIN 879. and master lead screw. b) Precision measuring instrument to choice (use nut or nut segment)	a) Mount master lead screw between centers and apply dial indicator to flank. b)Alternatively to measurement a) a test diagram traced by the lead screw when not installed may be presented.	a) and b) 0.04mm by 300mm L up to 2000mm measured at any point. If the turning length exceeds 2000mm, the permissible variation is to be increased by 0.005mm for each additional 1000mm, but without exceeding a maximum permissible variation of 0.05mm by 300mm. Local tolerance: 0.015mm by 60mm measured at any point.	a)..... b).....

8.3 PRACTICAL TESTINGS

No	Object of testing	Diagram	Machining conditions and Test apparatus	Test instructions	Variations	
					permissible	measured
P1	Working accuracy on longitudinal turning a) Roundness b) Cylindricity	 <p>$d \geq da/8$ da : maximum turning diameter $l = 0.5 da$</p>	<p>In the absence of any special agreements the manufacturer will specify:</p> <p>Form of tools used, material for the test workpieces (cast iron or steel) also feed rate, depth of cut, cutting speed etc.</p> <p>Test workpiece is to be mounted overhung in a suitable chucking device and finish turned in a single setting. Micrometer or clip with dial indicator according to DIN897</p>	<p>a) Two-point or three-point measurement.</p> <p>The largest diameter difference resulted is the amount of the variation.</p> <p>b) The difference in the two diameters turned is the amount of the variation.</p>	<p>a) 0.01mm b) 0.04mm l= 300mm</p>	<p>a).....mm b).....mm l=.....mm</p>
P2	Working accuracy on facing	 <p>$d \geq 0.5 da$ $l = da/8$</p>	<p>The workpiece to be mounted on a suitable chucking device. There are two or three circular planes. (one of them in the middle) that is to be faced in a single pass. Straightedge (of a suitable length in relation to diameter of the workpiece) and Slip gauge (clearance gouge).</p>	<p>Place straightedge on the faced surface of the test work piece , either direction or on two slip gauges of the same thickness. Determine distance between straightedge and test work piece by introducing slip gauges over the whole diameter.</p>	<p>0.025mm d=300mm</p> <p>The surface is allowed concave only.</p>	<p>.....mm d=.....</p>
P3	Accuracy of pitch on thread cutting	 <p>The pitch accuracy is verified by Geometrical test G3. Therefore the practical test P3 is carried out under special agreement, only .</p>	<p>Work piece to be mounted between centers and is finish cut in a single setting.</p> <p>The thread may start at any point on the lead screw.</p> <p>Precision measuring instrument.</p>	<p>The test instructions can be specified according to the type of precision measuring instrument used by the manufacturer.</p>	<p>0.04mm by 300mm L up to 2000mm . Measured any place. Local tolerance: 0.015mm by 60mm Measured any place.</p>	<p>.....mmmm</p>

9 OPTIONAL ACCESSORIES

9.1 TAPPER TURNING ATTACHMENT

Taper turning attachment is a lathe option used for machining internal and external taper surfaces up to 250 mm length and a angle $\pm 10^\circ$. It is mounted to the carriage base plate. The taper turning attachment design ensures high accuracy of machined surfaces, easy and reliable operation. Setting the taper turning attachment for operation is as following (Fig.9-2):

- By turning in nut 5 , bolt 2 is tighten to slide 6 of taper turning attachment;
- Bolt 2 goes in bracket 1 and is tighten by nuts 3;
- Bracket 1 is positioned on a suitable place along rear bed slide way and is fixed by three bolts 4 and a plate;
- Loose bolts 7 and 8;
- By screw 9 guide 10 is turned at the desired angle. The angle is read out on the scale;
- Tighten bolts 7 and 8;

Having taper turning attachment set as instructed above the workpiece machined surface must comply with following requirements:

- The cylindrical area in the beginning should not be greater than 8 mm (clearances in the system not eliminated);
- Angle deviation not greater than $\pm 15'$.

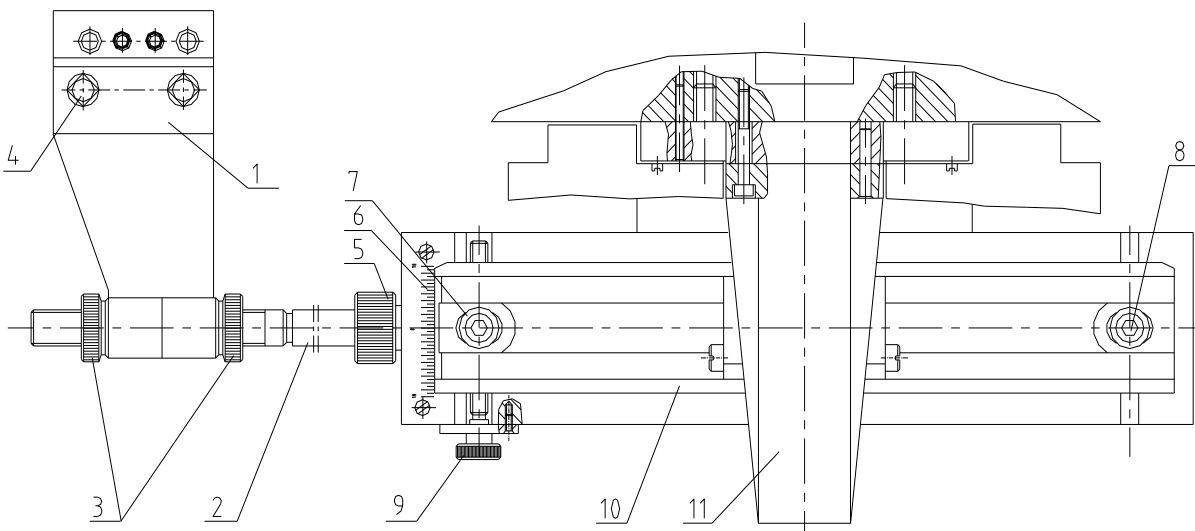


Fig.9-3 Taper turning attachment

9.2 THREAD DIAL

If ordered the thread dial (option) is delivered with the machine and when cutting thread it makes easy setting the cutting tool tip into the thread pitch shown on table 1. By stud 21 and lock screw 12 the thread dial is mount on apron right side wall.

Version 1:

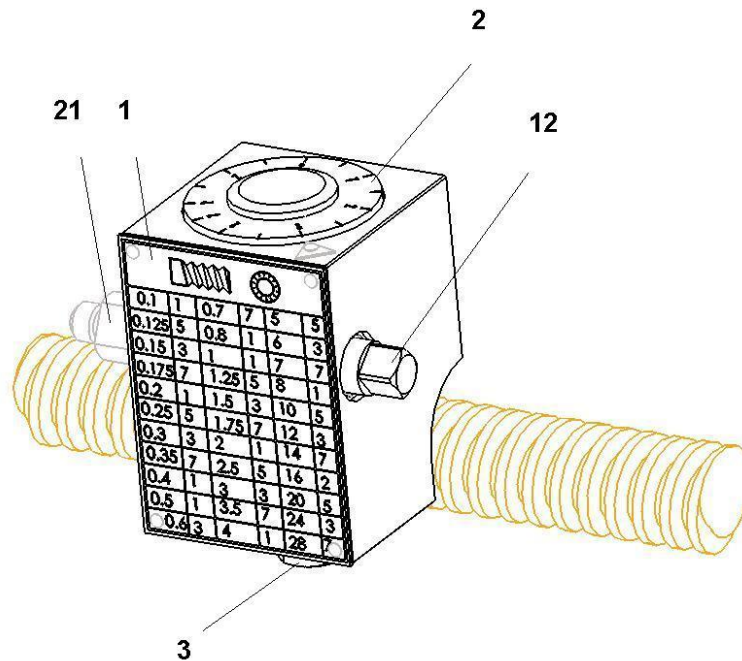


Fig.9-5A Thread dial

Table 1 is mount on thread dial body and is integrated part of it. To engage the thread dial to lead screw loose screw 12, turn the body around stud 21 so that thread dial gear engaged to lead screw. Then tighten screw 12. To disengage proceed by opposite order.

Two scales are available for metric version thread dial 1;3;5 and 1;2;7. To shift from one scale to another loose nut 3 and turn back scale 2, place a gear (Z=14 for 1,2,7 and Z=15 for 1,3,5) from nut 3 side and tighten nut 3.

Inch version thread dial is provided with one scale only 1,2,4.

Number 1 not shown on the scales. It is related to each notch of the scale .

Version 2:

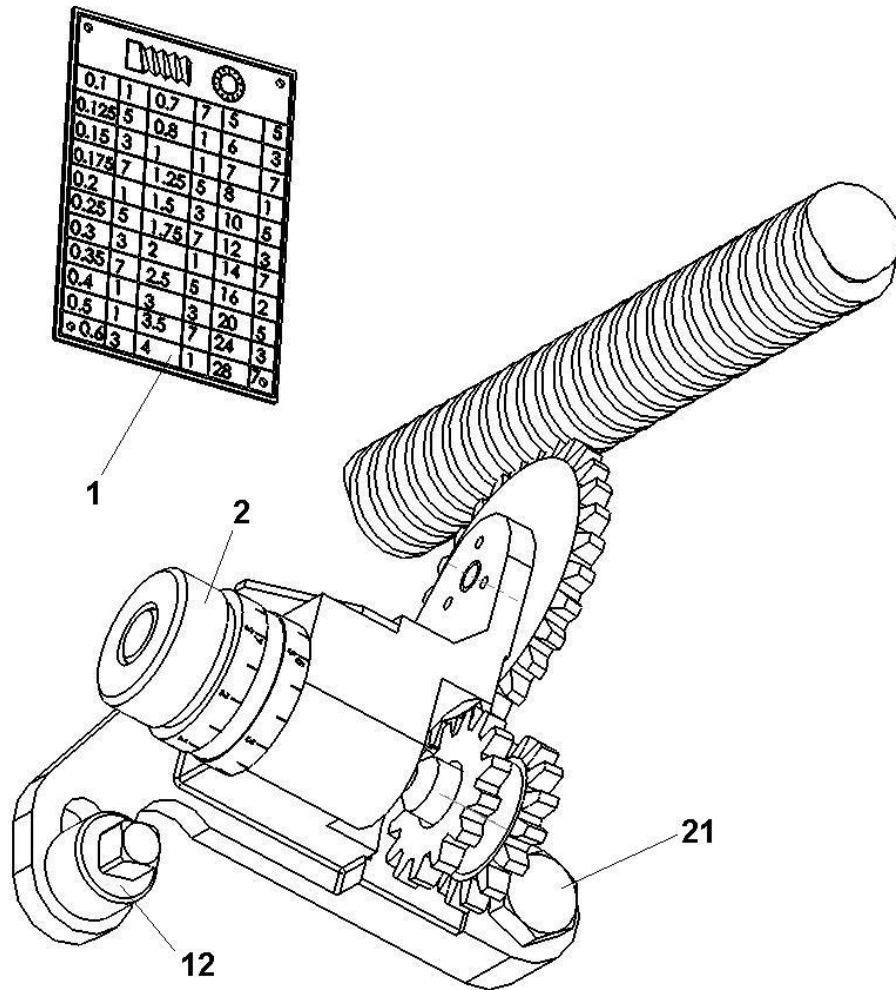


Fig.9-5B Thread dial

Table 1 is mounted on the apron and is an integrated part of it. To engage the thread dial to lead screw loose screw 12, turn the body around stud 21 so that thread dial gear engaged to lead screw. Then tighten screw 12. To disengage proceed by opposite order.

Two scales are available for metric version thread dial 1;3;5 and 1;2;7. To shift from one scale to another pull scale 2 or push it utmost in thread dial body.

Inch version thread dial is provided with one scale only 1,2,4.

Number 1 not shown on the scales. It is related to each notch of the scale.

Setting the thread dial for operation

- 1- Set the lead for cutting thread of any of shown on the table pitch.
- 2- Set the carriage on initial point and engage the half-nut to lead screw.
- 3- Engage the thread dial.
- 4- Reset the thread dial (position the number that relates to the pitch so that align with the pointer).
- 5- Cut the thread first start; disengage the half-nut and go back to the initial point.

- 6- Engage the half-nut by displacement the carriage so that the number that relates to the pitch to align with the pointer. Cut the second start.
- 7- For the following starts repeat item 5 and 6 until the thread is finished.
Then disengage the thread dial.

9.3 INDEPENDENT JAW CHUCK AND FACE PLATE

The independent jaw chuck and face plate without jaws are used for chucking workpieces having non-rotary shapes when machining their rotary surfaces (mostly holes). Chucking of such workpieces is performed by independent adjustment of each jaw on independent jaw chuck and using an additional angle accessory.

Mounting a chucking device on spindle nose is described under section 4.8.1 or 4.8.2.

Workpiece chucking on independent jaw chuck Fig.9-6 is performed by jaw 5, screw 4 and key 10. Each jaw is independently adjusted.

Warning: It is not admitted to exceed the speed marked on the chucking device.

The speed must be selected in relation to workpiece weight and shape, symmetric and centrifugal force that may be generated during rotation.

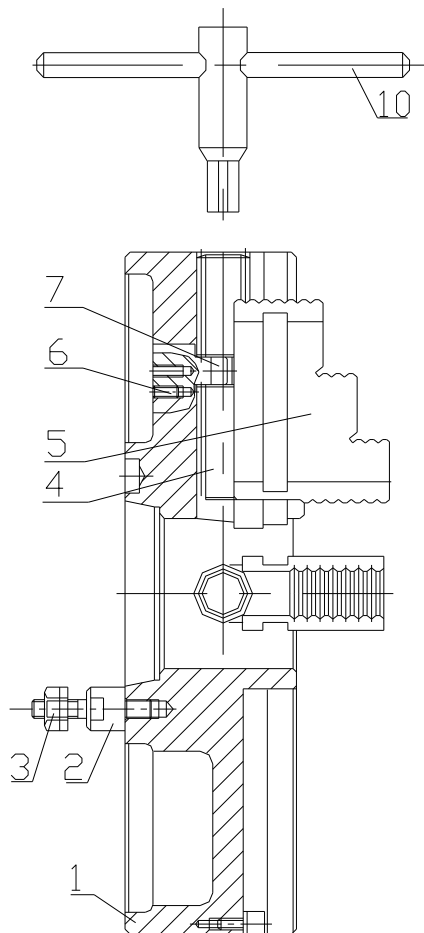


Fig.9-6 Independent jaw chuck

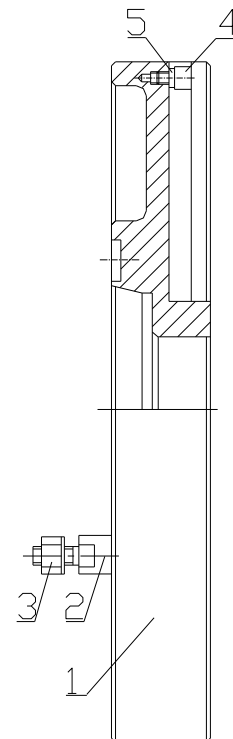


Fig.9-7 Face plate

9.4 DRIVER PLATE (CENTER LATE)

The driver plate (also known as centre plate) is a lathe option. Mounting method for the driver plate on spindle nose is same as described for 3-jaw self-centering chuck section 4.8.1 or section 4.8.2. A dead centre 3 is mount into spindle taper hole and into tailstock quill taper whole a live centre is mount. A lathe dog 4 is mount on the workpiece to be machined then the workpiece is mount between above said centres. The late dog 4 and drive pin 1 transmit rotation to the workpiece.

It is absolutely forbidden to operate dead centre on tailstock.

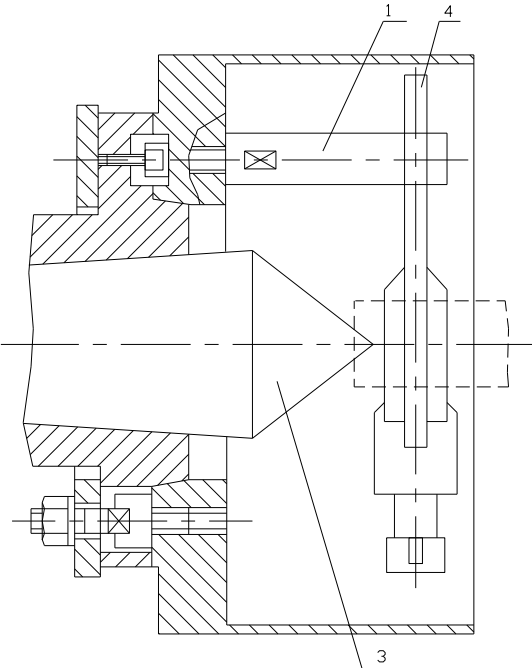


Fig.9-8 Driver plate

9.5 RESTS

(Fig.9-9 and Fig.9-10)

Follow rest and steady rest are lathe options used for additional support of the workpiece.

Follow rest is fixed to the carriage base plate by bolts 9. To support a workpiece loose bolts 8 by one-two turns. By handles 3 and screws 5 move the quills 6 so that the points 7 touch the workpiece. At this position tighten bolts 8 to lock the quills.

The follow rest is used to support long workpiece of small diameter.

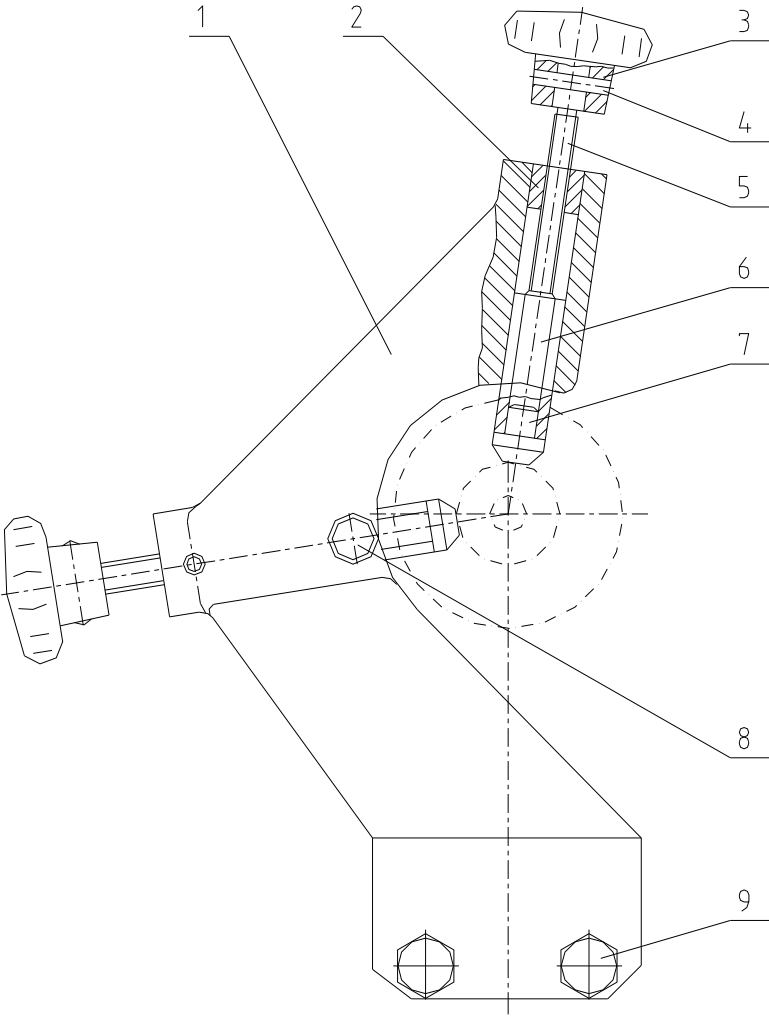


Fig.9-9. Follow rest

The steady rest Fig. 9-10 is mount fixed to bed slide ways by plate 16, bolt 15 and nut 13. For the purpose of workpiece supporting the steady rest is mount at suitable place along the bed. Then loose bolts 8 and pull out the quills 9 to utmost position. By loosening screw 11 the arc is opened. To support the workpiece move the quills 9 to the workpiece until points 10 touch to its surface. Then tighten bolts 8 to fix the quills.

The steady rest is used to support heavy workpieces of bigger diameter.

The steady rest may be also ordered completed with roller quills.

Warning: It is not admitted to support workpieces having uneven surfaces!

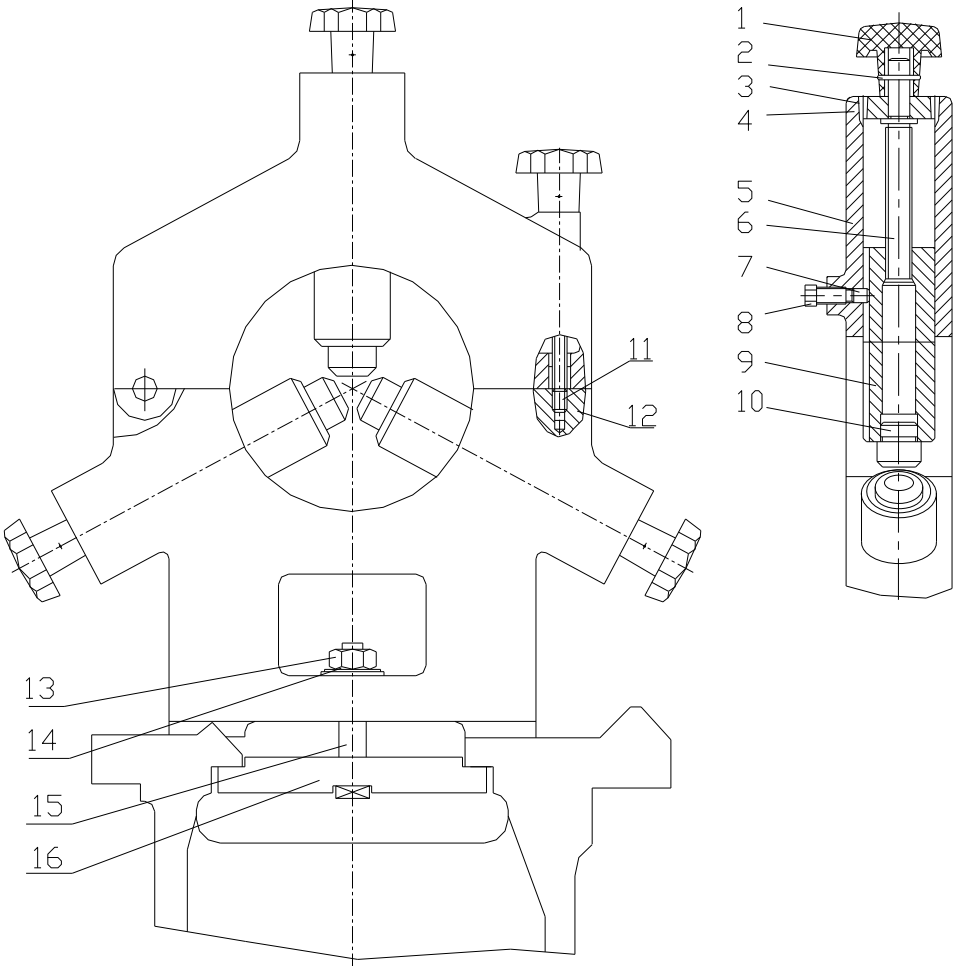


Fig.9-10. Steady rest